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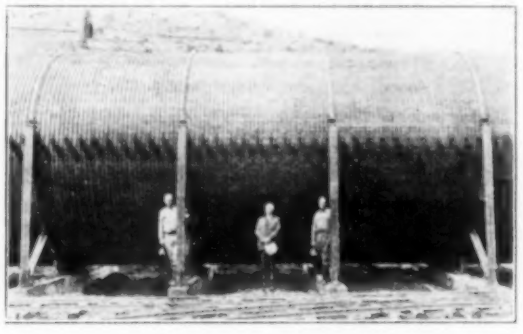
Castings Clamp Wooden Staves in Large Pipe Line

FLUMES made of wood annually conduct millions of gallons of water from the streams high up in the Rocky mountains to the coastal plains, where cities are supplied with this necessity of life, irrigation makes possible bounteous crops, and hydraulic installations generate electrical energy. A large wood pipe line recently completed is 1316 feet long, 16 feet in inside diameter. It is designed to with-



Many Castings Are Used in the World's Largest Wood Stave Pipe

stand a pressure of 26 pounds per square inch and discharge 1290 million gallons of water a day. Other installations, while not so large in diameter, use more material, due to the great length, one line being 33 miles long. Castings play an important part in such installations, since the wood staves are banded together by steel rods and the ends of the rods are connected by malleable iron shoes or lugs. Over 1000 tons of this type of casting is used for the western installations each year. The market for such castings is not confined to the coast, for two wood stave pipe lines will be constructed between a city in New Brunswick, Canada, and Madawaska, Me., for the international transmission of wood pulp. In any city where it is necessary to build special water tanks for large buildings, the wood staves are held together by steel bands and cast turnbuckles.

Find Where Castings Can Be Sold

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Heavy Work

Canadian Plant Is Weighty Work with Water Wheels Are

Fig. 1—Finished Casting Leaving the Cleaning Room

OPERATED as a subsidiary of the Canadian Car & Foundry Co., Ltd., it is only natural to find that the Canadian Steel Foundries, Ltd., with plants at Longue Pointe and Point St. Charles, Montreal, Que., and Welland, Ont., have large capacity for castings employed in railroad transportation and in other interests.

The various plants have a greater capacity than is warranted by normal demand in the railroad line and as a result orders are filled for miscellaneous castings of practically all descriptions. These include practically all high carbon and alloy steel rolls used by the rolling mills in Canada, manganese steel castings for the mining industry and manganese and built up track work for both steam and electric railroads, locomotive and ship castings of all sizes. The company has specialized for the past several years on the large and intricate steel castings used in connection with hydroelectric development of Canada's water power.

The accompanying illustrations are from photographs taken in the Longue Pointe plant at the time an order for large water wheels for a western power project was going through.

Before taking up in detail the methods employed in molding these large steel castings, it may be of interest briefly to outline the details of shop and equipment.

The foundry building at Longue Pointe Works, of steel construction, 260 feet x 650 feet, is supported in the center by three rows of columns which serve to divide the floor area

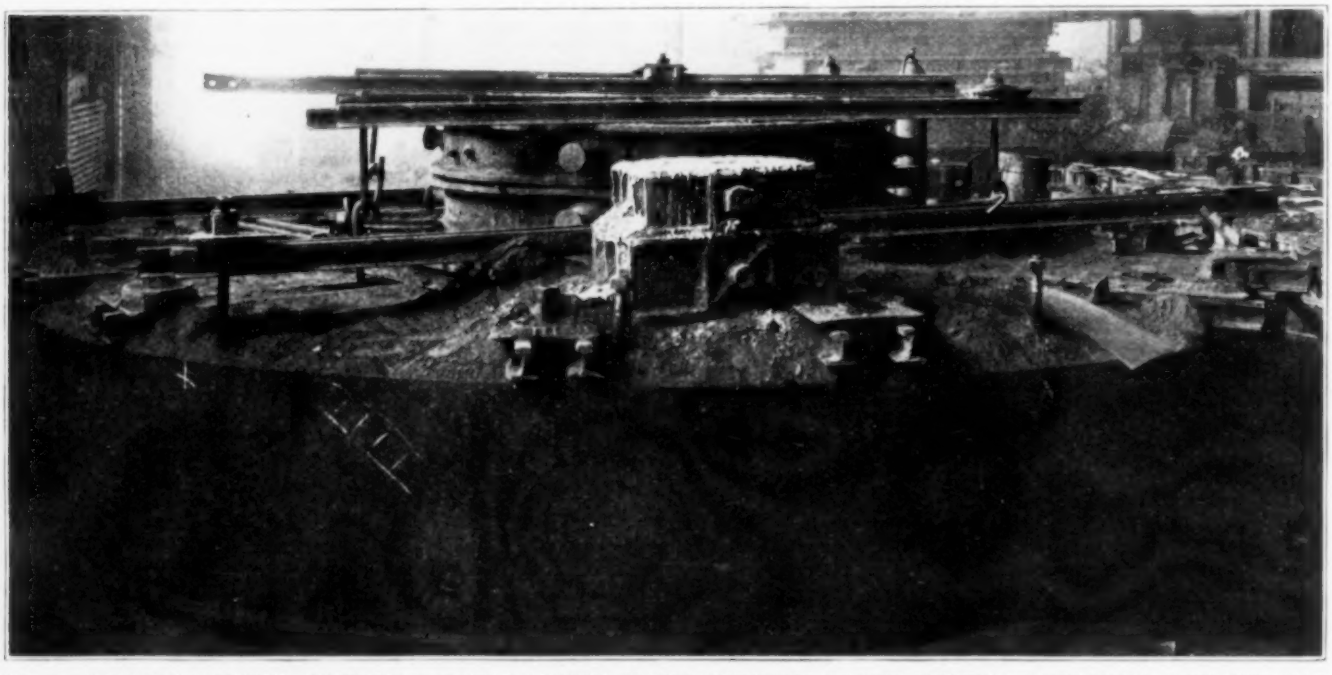


FIG. 2—STEEL WAS POURED THROUGH A SINGLE RUNNER WHICH EXTENDED TO THE BOTTOM OF THE MOLD. THE HUB WAS NOT COVERED BUT WAS EXTENDED UPWARD FOR 3 FEET TO SERVE AS A SINK HEAD

Demands Skill

Equipped To Handle Efficiency — How Molded and Cast

By Pat Dwyer

FIG. 5—THE COREBOX WAS BRACED ON THE OUTSIDE AND THE CORNERS SECURELY BOLTED TO PREVENT DISTORTION

into four general departments. Dry sand molds are made exclusively in one section. The second department is devoted almost entirely to the use of the coremakers and a considerable amount of space is taken up by the mold and core ovens. Green sand molds, principally railroad equipment including manganese steel frogs and switches, are made in the third bay. Three 25-ton basic-lined open hearth furnaces, and one 3-ton heroult electric furnace, together with their auxiliary equipment, occupy the greater part of the space in the fourth main division of the building.

That part of the building in which the coupler fitting department is located is 100 feet longer than the other division. Recently an addition, 65 feet wide and the full width of the four bays, was erected at one end of the building, parallel to another side of the same dimensions. The new section is to serve exclusively as a cleaning and shipping room and will relieve the congestion in the foundry where heretofore the castings were cleaned near the ends of the two molding bays in which they were made.

To save transportation, many of the large castings are rough cleaned and chipped close to where they are cast, and then placed in the annealing oven. This practice probably will be continued in exceptional cases. Heat treatment along modern lines demands double or triple treatment for castings of heavy section, up to 3 feet. All annealing is carefully controlled by up to date pyrometric equipment.

In addition to the usual car-type annealing ovens where the smaller castings are annealed, a large pit furnace 22 feet square 8 feet deep is provided for annealing large castings. The side walls of this furnace project 2 feet above the floor level and support a roof made of removable bungs. The center support is water cooled. It extends from one side of the furnace to the other and serves as a resting place for the inner ends of bungs which are placed at right angles to it. In other words, the center support may be compared to the ridgepole on a roof, and the bungs correspond to the rafters. Temperatures are controlled by numerous recording pyrometers.

This annealing oven and indeed all the other heating and melting units in the shop are fired with oil. Practically the only exception to this rule is a row of crucible pit furnaces in

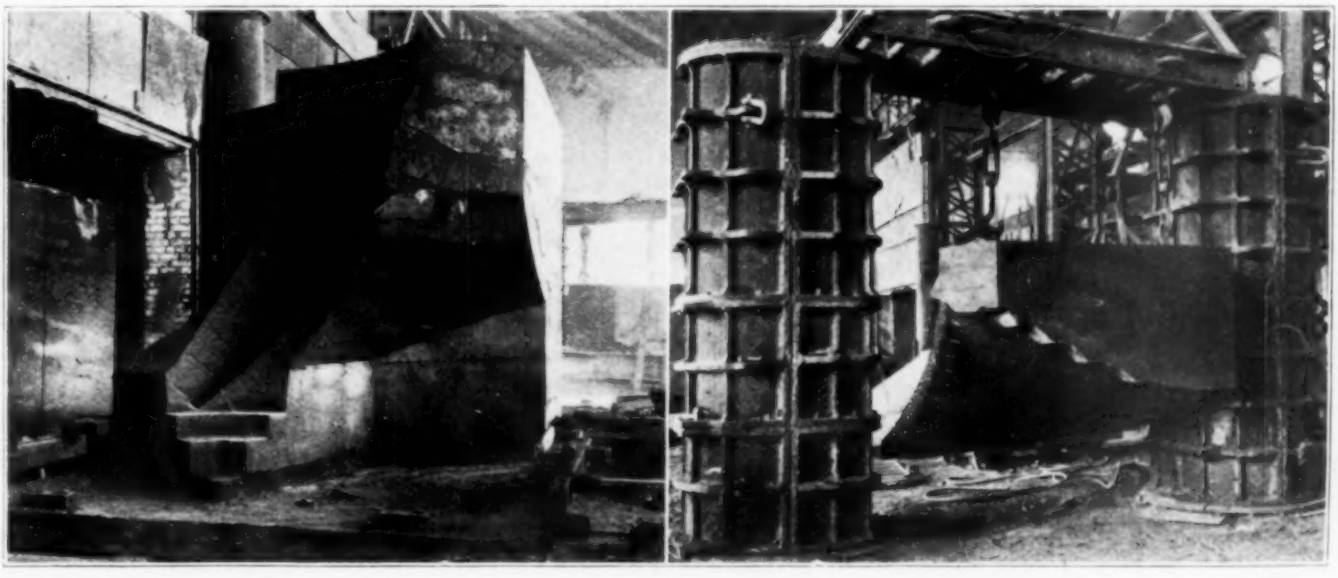


FIG. 3—ONE OF THE COMPLETE CORES ASSEMBLED AFTER THE COREBOX AND PATTERN HAD BEEN REMOVED. FIG. 4—THE TOP HALF OF THE CORE WAS SUSPENDED FROM AN IMPROVISED STAND WHILE IT WAS BEING FINISHED

which ferromanganese is melted with anthracite coal when a heat of manganese steel is required.

In preparing a heat of manganese steel, the required amount of ferromanganese is melted in crucibles in a row of pit furnaces fired with anthracite coal. The time of melting is calculated to synchronize with the melting time of a regular steel heat in one of the open hearth furnaces. The low carbon steel from the open hearth is tapped into a 25-ton bottom pour ladle in the usual maner. After casting some miscellaneous work, the metal then is poured through the nozzle into a smaller bottom pour ladle, resting on a scale and containing the molten ferromanganese. This method ensures accurate control of the manganese content.

The electric melting furnace practically is used exclusively for alloy steels, chiefly high carbon 2 per cent chrome for mining equipment.

In addition, chrome nickel and chrome molybdenum steel are regularly made in this furnace. Castings up to 5 tons in weight are made from electric steel.

Open hearth furnaces are of the stationary type, and are elevated a sufficient height above the floor to permit the introduction of a ladle under the pouring spout. This arrangement necessitates a high charging platform on the opposite side to which all the materials for charging the furnace are hoisted by a crane.

Materials Arranged for Accessibility

Scrap steel materials and limestone are stored in low sided bins in the yard and the ferroalloys are stored in bins adjacent to the open hearth charging platform. A steam yard crane loads the materials on company's railroad cars which are switched into the open hearth building at rear of furnace charging platform. Inside an electric crane is used to load these charging materials into standard open hearth charging boxes which are then placed three on a car located on a standard gage track, laid directly in front of the open hearth furnaces. These cars are moved along this track and the contents of the charging boxes dumped in the furnaces by a standard high type electrically operated charging machine.

Considering the prodigality with which mineral wealth of practically all description is scattered throughout Canada, it is reasonable to expect that a silica sand with a natural bond, suitable for making steel castings is in existence some place. Up to the present none has been discovered. Several deposits of pure silica sand which requires an artificial bond are being worked.

Without exception the steel foundries on the northern side of the international boundary line import the majority of their silica sand and clay from the United States. The Canadian Steel Foundries, Ltd., uses sand from New Jersey and Pennsylvania deposits and the clay is secured from various sources.

The dry sand molding facing sand is milled and tempered in the ordinary wet pan mill from a mixture of Pennsylvania and New Jersey sands, containing a natural bond. Green sand molding requires a sharp silica sand mixed with finely ground fire clay and tempered with water. Special facings are used for the manganese steel work, some containing vegetable binders having the property of surface drying the mold quickly.

Skin drying on special green sand work is resorted to. Some of the smaller cores, especially those destined for severe service are made entirely from new sand held together by a suitable binder.

Large cores for ordinary purposes contain the usual amount of heap sand with small quantities of fire clay.

Make Varied Line of Castings

Drawbars are made in large quantities in the same manner as that practiced at the plants of the National Malleable & Steel Castings Co. The molds are made on jolt stripping machines and the cores are made in metal core boxes mounted on trunnions above stripping tables that received the cores when the boxes are in an inverted position. The plates are drawn away from the boxes by hand, bearing the cores with them.

The steel runner for a hydroelectric plant shown in Fig. 1, is designed to operate at high speed under low head. A standard method has been developed and is practiced in every foundry where water wheels are made.

In the Francis type of wheel in which the vanes are nearly vertical and set close together, the usual practice is to construct a core box to form the vanes. The core from this box forms the outside surface of one vane and the inside surface of the adjoining vane. On account of the peculiar shape and size of the wheel shown, a different method was adopted.

A core box was designed and constructed in such a manner that an entire core in two parts formed a mold for one vane, including a segment of the hub. The outside of the core conformed to radial lines so that when all the cores were assembled there was no play between them. The Francis wheel mold is assembled on a split plate. Approximately two-

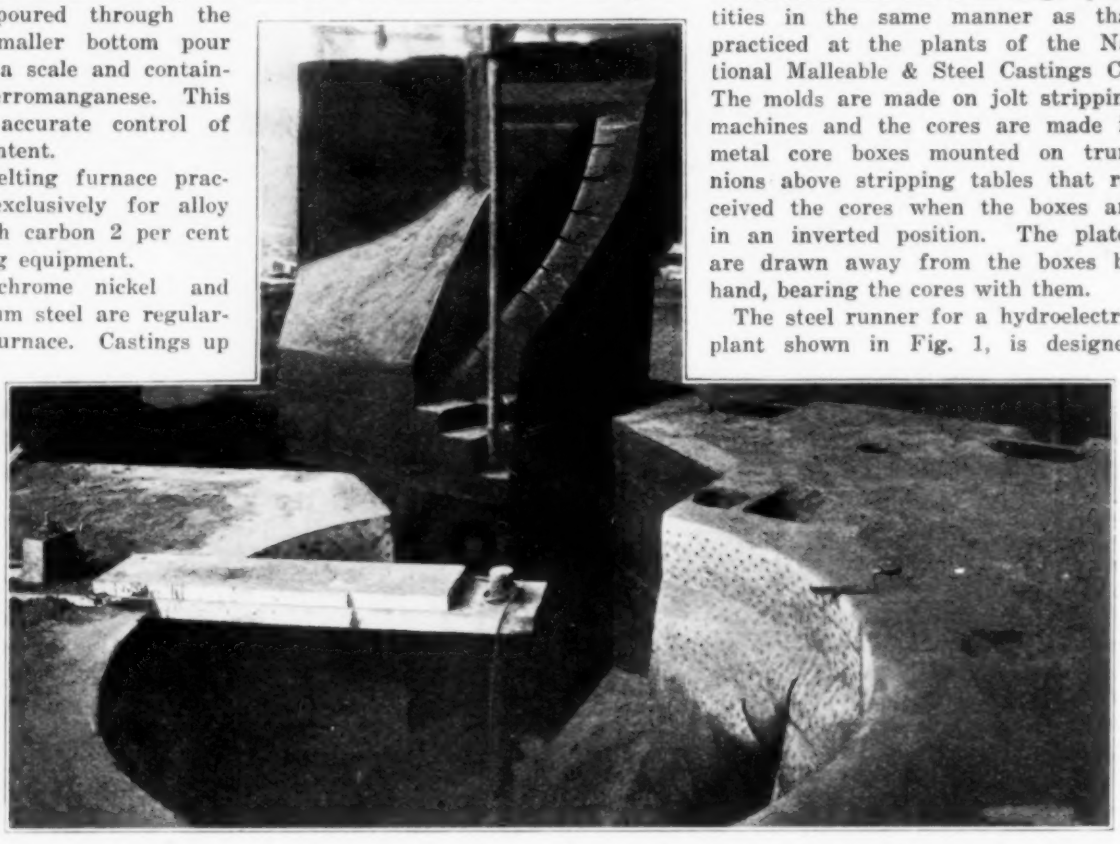


Fig. 6—Lowering the Last Core Into Place

thirds of the cores are assembled in place, then the halves of the plate are separated, the remaining cores are placed on the movable half, which then is pushed back into place. In the wheel mold, under discussion, each core was rammed and dried on an individual plate and the plate remained an integral part of the core until the casting was shaken out. This feature may be noted in several of the illustrations. The cores were made in the strongly reinforced box shown in Fig. 5, and each core embraced exactly one sixth of a circle.

Like A Snap Flask

To a certain extent, each core is a complete mold in itself, since it contains the cavity for one of the vanes and also forms one sixth of the hub face. Also each core may be compared to the body of sand formed in a snap flask.

It is in two parts separated at the junction by an irregular parting line. This feature is clearly indicated in Fig. 10, where the upper half of the core is shown suspended above the lower half.

Briefly the procedure of making one of the cores is as follows: The vane pattern including one sixth of the hub is adjusted in the proper position in the core box as shown in Fig. 9. A foundation plate and arbor are placed under the vane pattern and sand is rammed in the box until it is piled up to the parting line all around. The side of the box and the joint blocks are built in sections and assembled as ramming progresses. A regular parting surface is prepared after which the upper half of the arbor is adjusted in place and the remaining space in the core box is rammed full of sand. The frame of the box is removed, the upper half of the core is lifted with suitable hooks, the vane pattern is removed, the face of the mold is nailed, finished and coated with silica wash. The upper half of the core then is returned to its place on top of the bottom half of the core. Temporary

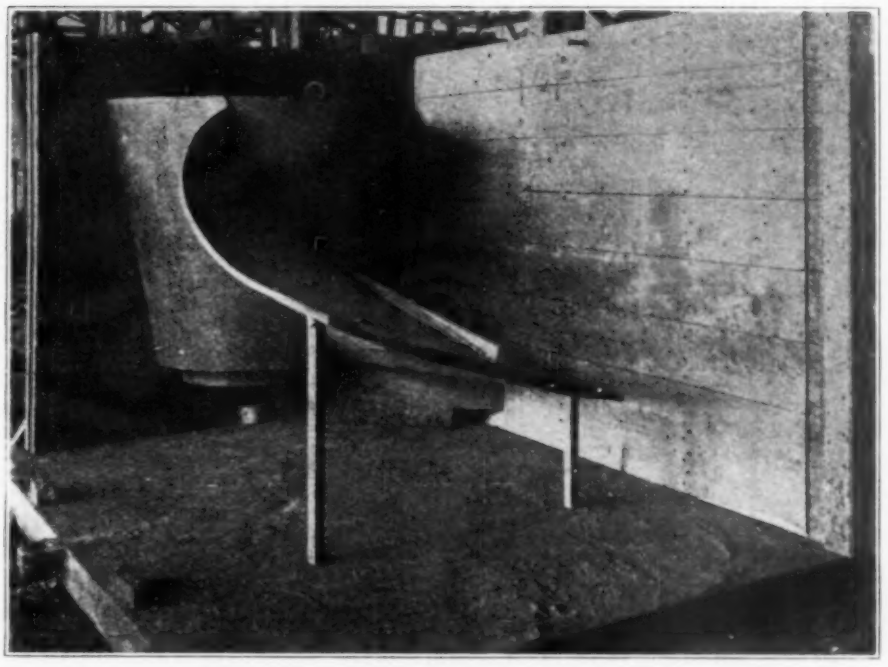
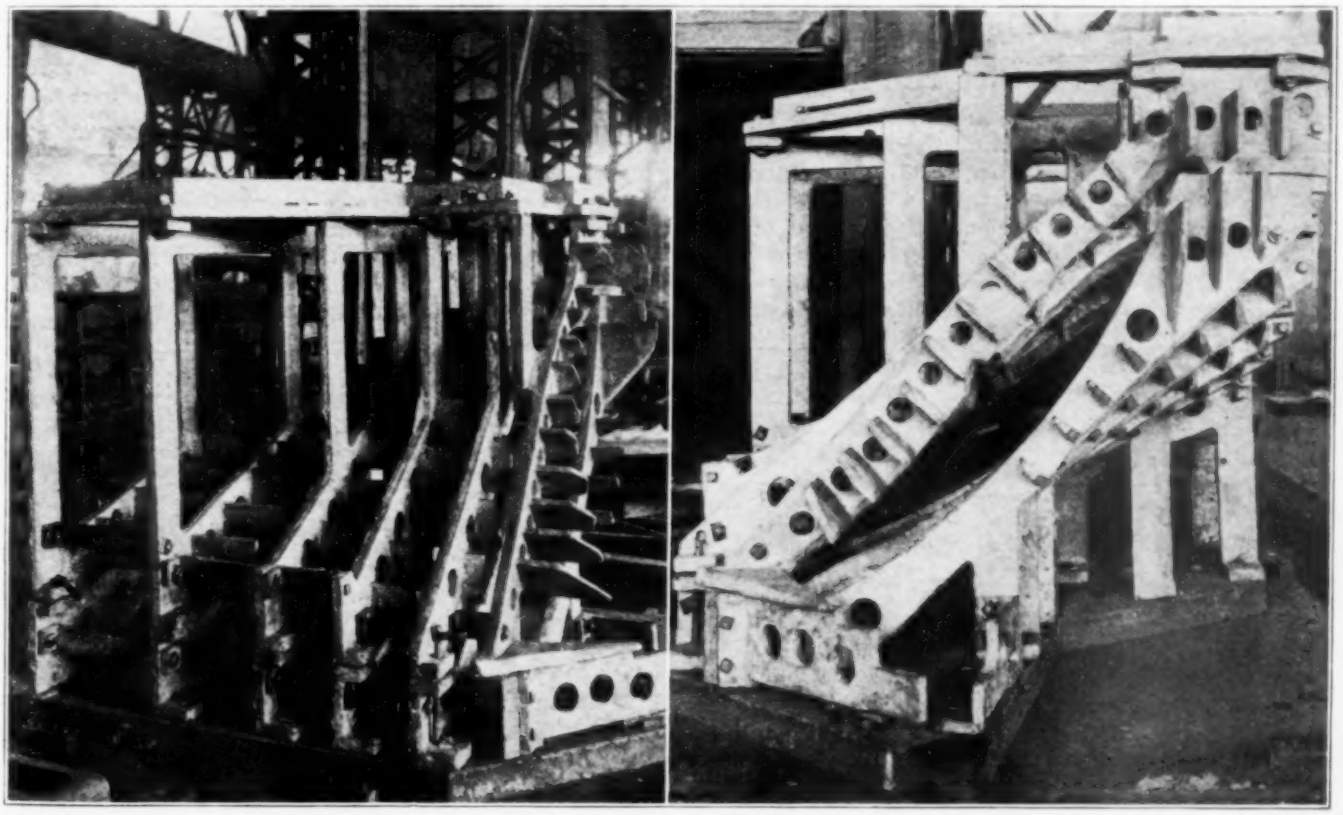


FIG. 9—THE PATTERN FOR THE BLADE WAS MOUNTED IN THE CENTER OF THE CORE BOX AND THE CORE WAS RAMMED IN TWO PARTS, ONE ABOVE AND ONE BELOW IT



FIGS. 7 AND 8—BACK AND SIDE VIEWS RESPECTIVELY OF THE SUBSTANTIAL ARBOR EMPLOYED TO INSURE THE PROPER RIGIDITY IN THE CORE. THE LOWER PART IS BOLTED TO THE FOUNDATION PLATE AND THE UPPER HALF RESTS ON THE LOWER

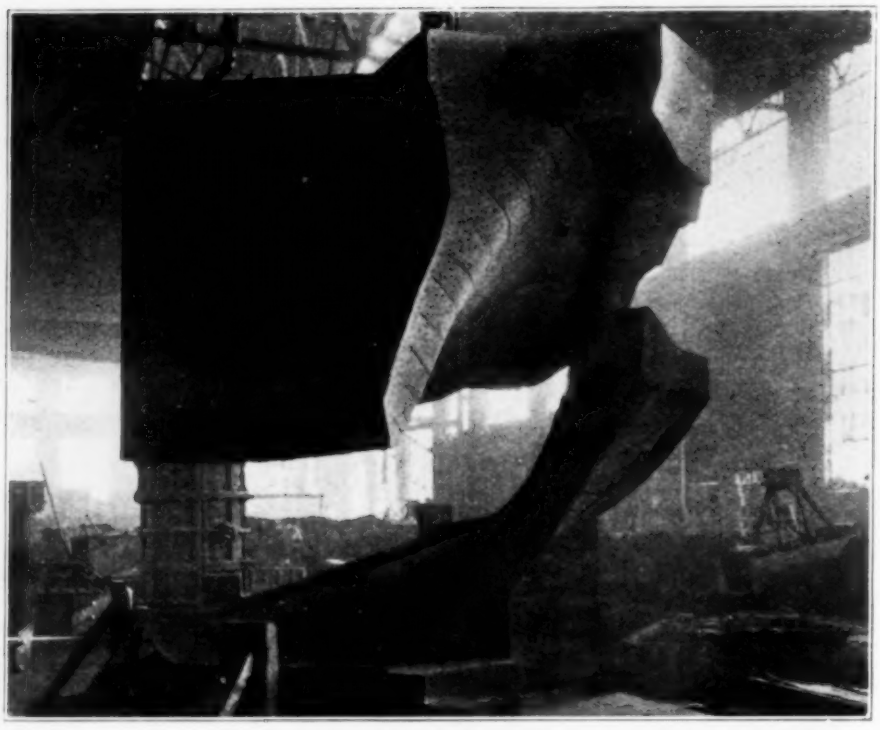


FIG. 10—TEMPORARY WOOD GUIDES BOLTED TO THE FOUNDATION PLATE SERVED TO LOCATE THE UPPER HALF OF THE CORE ON THE LOWER HALF

wood guides bolted to the plate before the top half of the core is lifted, serve to locate it in the proper place on its return. The entire core then is lifted by the foundation plate and placed on a car which conveys it into one of the drying ovens. Details of the core box assembly are shown in Fig. 11. The set of cores forming the mold were assembled on a large machine plate in the bottom of a pit. Radial and circumferential lines on the plate were used to locate the cores in place properly. Adjoining faces of the main foundation plate and the individual plates on the bottom of the cores were machined to a true flat surface. On account of the overhang on the sides, the cores could not be lowered by the crane directly into place. They were lowered to a point as nearly correct as possible and then pushed horizontally the remainder of the distance with jack screws braced against the walls of the pit.

Elaborate and massive type of equipment used in making the molds for castings of this kind is shown in Figs. 7 and 8, presenting two views of the upper and lower core arbors as they appear in assembled position. The substantial character of the base plate to which the members are bolted and the rigid character of the frame work furnish interesting contrast to the handful of small rods or wires that do service in many of the cores made in the average jobbing foundry.

The weight of one unit core section is approximately 20 tons. The weight of the finished casting was 76,000 pounds.

Booklet Shows Reduced Labor Equipment

A common foundry problem is high labor cost. To show the application of mechanical equipment in reducing the cost, the C. O. Bartlett & Snow Co., Cleveland, has issued a 25-page catalog describing machinery for sand handling.

The catalog enumerates the various factors that enter into production of castings and mentions that handling sand constitutes from 35 to 50 per cent of the tonnage charge for material handled in the foundry. By the use of sand handling machinery this cost may be lowered considerably.

Conveyors, material handling machines, continuous molding equipment, and sand conditioning machinery are described in the catalog. Many illustrations from photographs of installations are used to show the application of the various types of machines manufactured by the company.

Publishes Handbook on Furnace Electrodes

The third edition of the *Carbon Electrode* has been published by the National Carbon Co. Inc., New York. The book contains a brief history of the carbon electrode and the electric furnace. The manufacture, characteristics and use of carbon electrodes are described as are the handling, storing and the joining of electrodes.

Methods of securing economy in electrode consumption are given. Engineering data such as useful tables, and electric furnace wiring diagrams, occupy 35 pages. The book contains 115 pages and is pocket size.

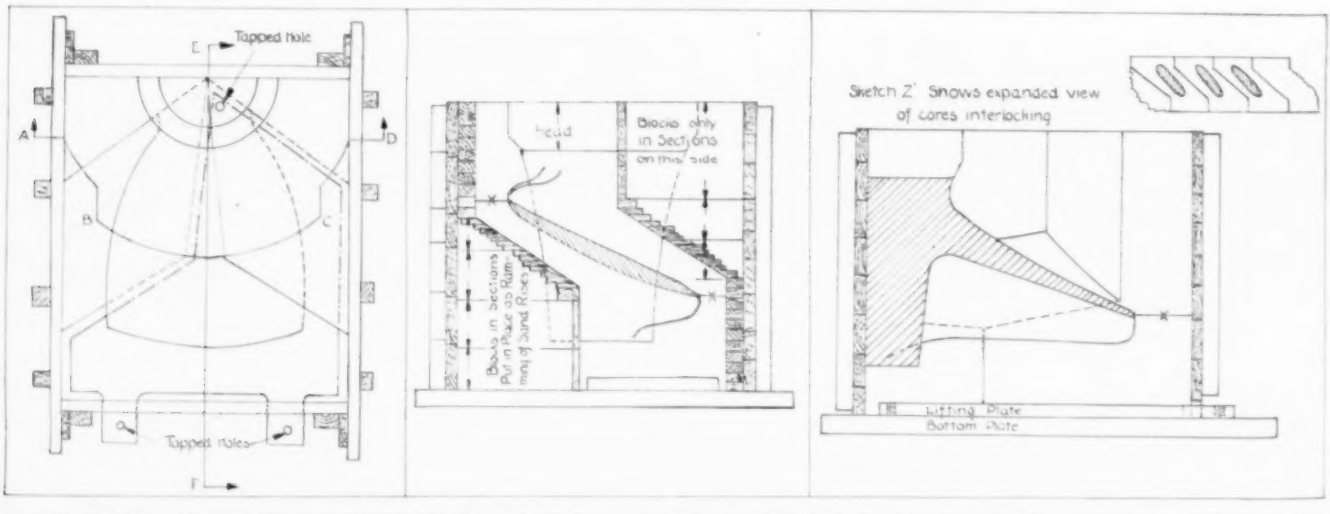


FIG. 11—PLAN AND SECTIONAL ELEVATIONS OF COREBOX SHOWING APPLICATION OF THE LIFTING PLATE AND THE LOOSE BLOCKS BY WHICH THE COREMAKER WAS AFFORDED AN OPPORTUNITY OF RAMMING SAND UNDER THE BLADE

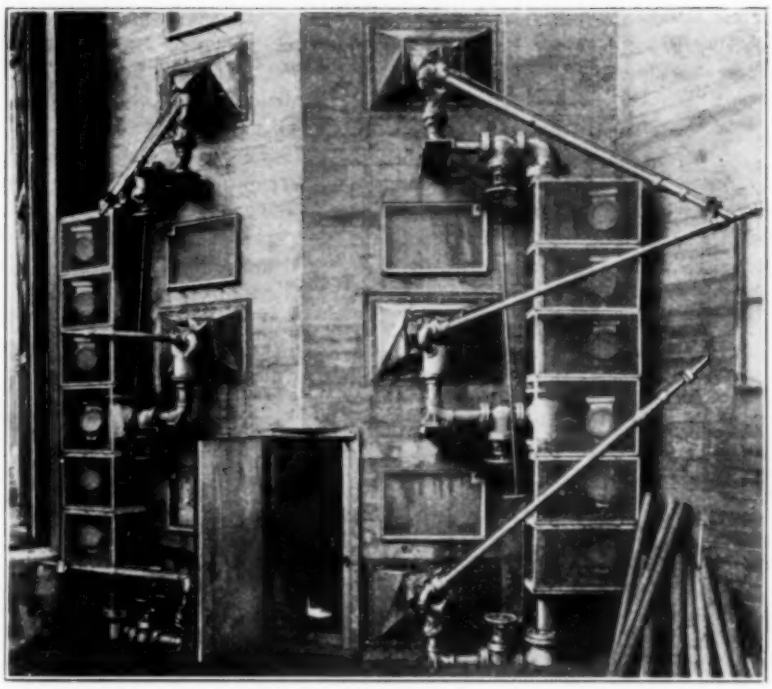


Fig. 1—Nozzles Project Into the Cleaning Chamber and Are Controlled by Operators Located Behind the Concrete Wall in the Background. Strong Glass, and Wire Mesh Provide Full View of the Work, While Ample Light on the Work Is Afforded by Two Banks of Flood Lights

Cleans Castings Hydraulically

High Pressure Columns of Water Dissolve Cores and Knock Burnt Sand from Surface of Heavy Iron Castings

By E. C. Barringer

CLEANING castings by direct action of a stream of water under high pressure as practiced at the plant of the Allis-Chalmers Mfg. Co., Milwaukee, has reduced the time per casting from hours to minutes. Castings up to the largest size poured by this manufacturer of turbines, motors and heavy machinery of every sort, are swung by a traveling crane into a concrete chamber and deposited on a turntable. A workman pushes a button and a three-section telescopic roof closes. Another button controls the doors at one end which swing shut. A third button sets in motion a 6-stage centrifugal pump.

A stream of 425 pounds pressure, powerful enough to drive through a heavy plank, surges through a nozzle balanced so well that one man directs it. The flint-hard core is dissolved as though it were so much sugar and a flood of ink-black water comes rushing out and down into the settling basins below. Gaggers and short lengths of rail, used as supports, come hurtling out. In an incredibly short time the casting is entirely cleaned, ready to be lifted out and sent to the machine shop.

The saving in labor and time is difficult to calculate, but even conservatively it fulfills a cost man's dream of heaven. In general two men now are said to do the work that for-

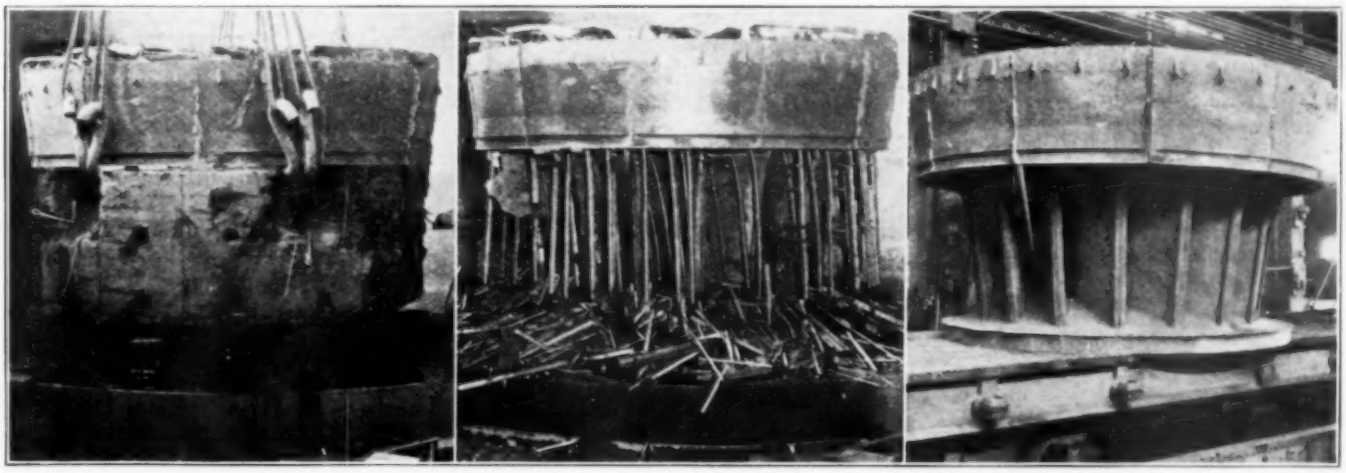


FIG. 2 LEFT—PLACING A TURBINE RUNNER CASTING, AS LIFTED FROM THE MOLD UPON THE TABLE OF THE CLEANING ROOM. THE TOTAL WEIGHT AT THIS STAGE IS 110 TONS. FIG. 3—CENTER—ADHERING SAND REMOVED AND LOOSE BARS DISPLACED AFTER AN HOUR AND FORTY MINUTES. FIG. 4—RIGHT—CLEANED CASTING ON A FREIGHT CAR FOR REMOVAL. TOTAL WEIGHT 40 TONS

merly required 60. For example, a hydraulic turbine runner, weighing 110 before and 40 tons after cleaning now is handled in 14 instead of 300 hours.

Steps in the cleaning of such a casting are shown in Figs. 2, 3 and 4. The sand and water are recovered. The cleaning end of the main foundry building is the least dusty and most orderly portion. Castings are routed through so expeditiously there is no accumulation; even taking into consideration the chamber and the auxiliary equipment, all of which are housed within the main foundry building, the cleaning department requires less space than heretofore.

The idea behind hydraulic cleaning is not new to Allis-Chalmers engineers but the actual application is. Cleaning castings by hand always was recognized as dirty, disagreeable and dust-raising work and theoretically the use of high pressure water seemed superior, but not until the increase in business in 1923 did the necessary prompting appear. Labor was scarce, the building trades offered employment out of doors at good wages, and a day or two was the most that even foreign workmen would wield a pick on a core. Casting work was farmed out to foundries from Birmingham to Minneapolis, and production of the main Allis-Chalmers foundry was sharply curtailed by cleaning room congestion.

So in the fall of 1923, the company's engineers were galvanized into action. The basic thought comprised a turntable bearing a casting on which a stream was played from a tower. For development purposes a 16-inch boring mill with a table was rigged up. In this small way the idea was seen to be feasible. An outdoor experiment was conducted whereby a casting was suspended from a locomotive crane and a 255-pound stream played upon it. It so happened that the first casting thus cleaned was a pump chamber, and even at this crude stage the time required was 18½ minutes, compared with 16 hours by the old method.

Authorization then was forthcoming for a temporary washing pit which was installed outdoors. A wooden tower for the operators was constructed and a turntable placed below a 30-ton yard crane. Large castings were mounted on a turntable on a 100-ton flat car, the car backed up against the tower, the motor turning the turntable was plugged in and the castings were cleaned successfully and swiftly. This temporary plant was operated through 1924 until cold weather interfered, but meanwhile a permanent plant within the main foundry building had been designed.

This permanent plant is a concrete chamber in the center bay of the main foundry building, 15 feet from one end. Inside, it is 34 feet wide, 45 feet deep and 20 feet high. An extraordinarily good mixture was used for the walls, which are 1 foot in thickness, and one man was kept ramming continually. To minimize erosion, the lower portions of the inside walls in the direct line of the nozzles, are lined with plates. The roof, which is of steel plates, is in three interlocking sections, with wire glass inserts for three lights in each section. Each section is operated by its individual motor but the three motors are controlled by one button. In 40

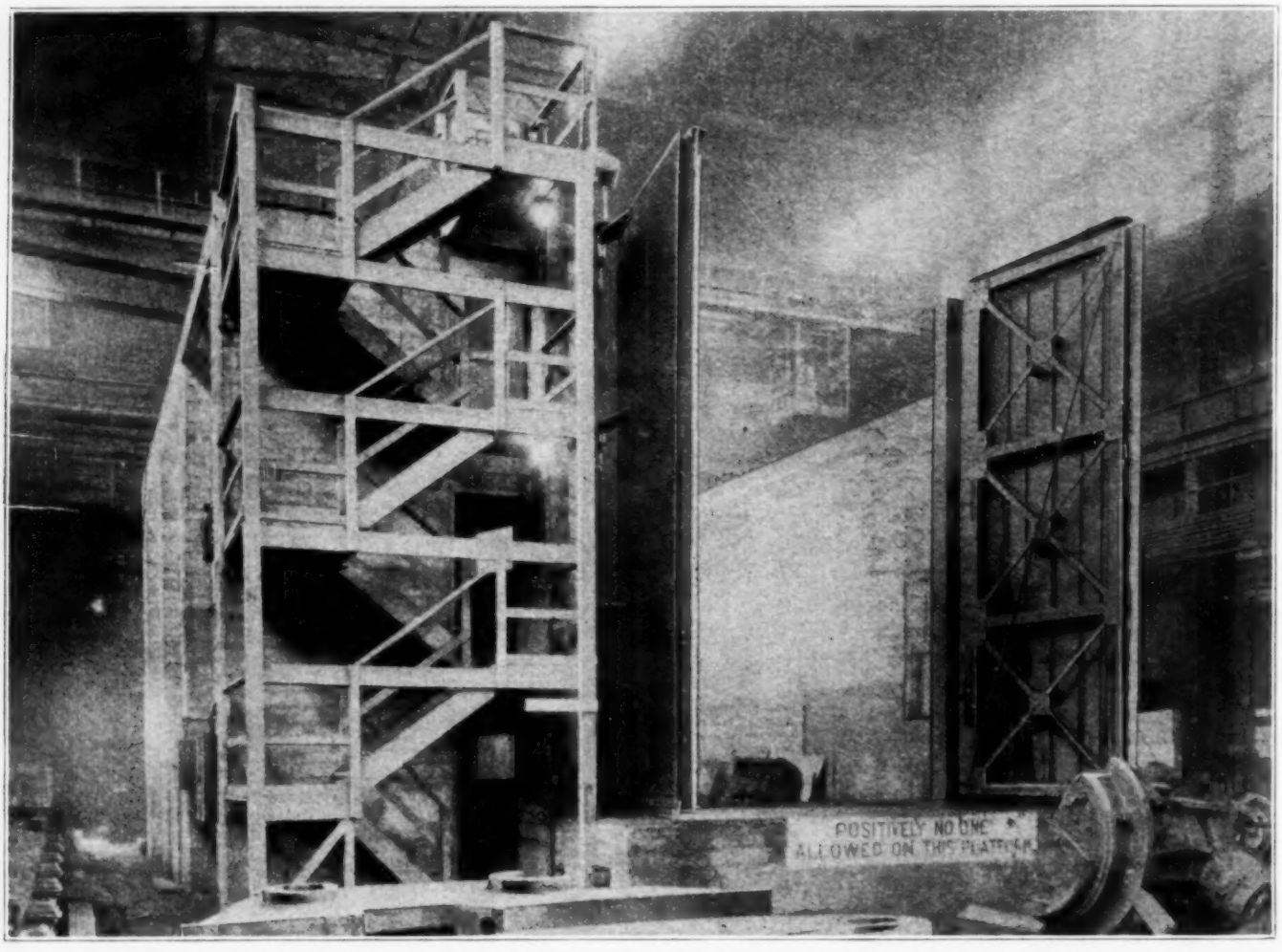


FIG. 5—THE CLEANING CHAMBER TOWERS ALMOST TO THE LEVEL OF THE CRANE RUNWAY. THE ROOF IS TELESCOPED AND THE END DOORS OPEN TO SHOW THE INTERIOR. THE OPERATOR'S HOUSE IS SHOWN AT THE LEFT

seconds the roof can be opened or closed. Fig. 6 is a view down into the chamber with the top doors open.

The two doors, shown in Fig. 5, are 20 feet high and give a clearance of 15 feet across. Remote push button control operates the 2-horsepower motor which works with a bell crank motion, using a gear reducer manufactured by the Foote Bros. Gear & Machine Co., Chicago. One door leads the other and only 10 seconds is required for opening or closing. Canvas belting at the joints prevents leakage.

Just inside the doors, as shown in Fig. 8, is a 10-foot table mounted on roller bearings and driven by a 25-horsepower motor. This table sustains a weight of 100 tons. To the rear of this smaller table, and also off center, is a 20-foot 300-ton table driven by a 35-horsepower motor. This larger table is mounted on 22-inch rollers, which are not affected by sand. Surrounding both of these tables are steel pans with 1½-inch openings which admit the sand but catch the gaggers.

In one corner, equally distant from each of the tables, is the operators' house. As shown in Fig. 1, a front view of the operator's house, there are two stands with three nozzles each mounted at three levels, one set playing upon the larger table and the other on the smaller. Both of the tables are worked together and one nozzle at a time is used on each of the tables. The castings on the larger table are subjected to the play from a 1 1/16-inch nozzle and on the smaller table from a ⅝-inch nozzle.

The water for these nozzles is supplied by a 4-inch 6-stage centrifugal pump direct connected to a 300 horsepower, wound-rotor, induction type motor, as may be seen in Fig. 7. At 1765 revolutions per minute this pump supplies 800 gallons of water per minute at a 900-foot head. Using two nozzles gives a pressure at the nozzle of 425 pounds. On the horizontal plane the nozzles are carried on ball bearings, while the stream itself balances them on the vertical plane. The longer nozzles, which are 7 feet, are counterbalanced. Within the nozzle mouths are guide vanes to prevent a swirling motion of the water.

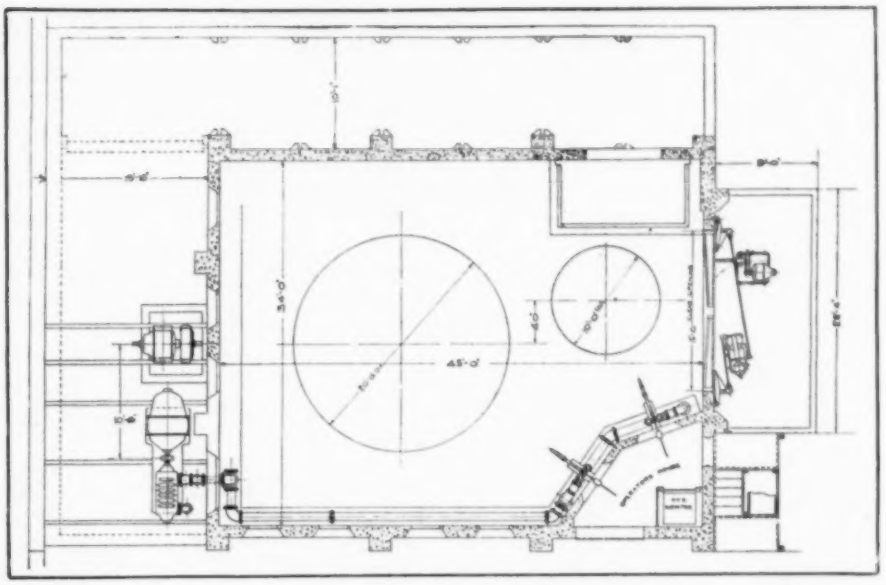
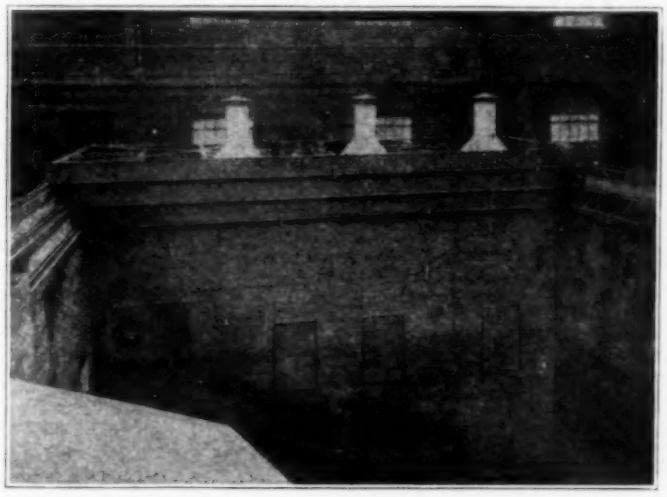


FIG. 8—TWO TURNTABLES WITHIN THE CLEANING CHAMBER PERMIT THE CASTINGS TO BE TURNED ABOUT SO THAT THEY ARE SUBJECTED TO DIRECT FORCE OF THE STREAM FROM THE NOZZLES

Beside each stand of nozzles is a series of six flood lights adequately protected by wire mesh as illustrated in Fig. 1. In operating the nozzles the two men employed stand behind ¼-inch wire glass windows further protected with 1½-inch mesh screens as their first line of defense against flying gaggers and sand. The constant accumulation of sand on these windows is washed down by a manually operated water curtain. The three heights of nozzles necessitating many quick changes, it was found a decided economy to install a hydraulic elevator in one corner of the operators' house. The discharge from the elevators is all the makeup water necessary for the operation of the chamber; in fact, there usually is an overflow. Push buttons in this house control the motors operating the top, doors, pump and turntables. As a safety measure, the door leading from the operators' house into the chamber proper is so interlocked with the pump control that the door must be made secure before the water can be turned on.

The floor of the chamber slopes toward the end of the sump. Be-



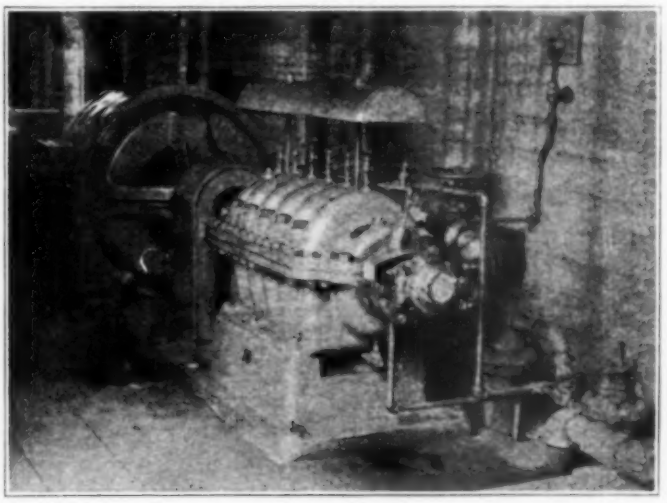


FIG. 6—LOOKING DOWN INTO THE CLEANING CHAMBER. THE THREE TELESCOPING SECTIONS OF THE ROOF ARE SHOWN PUSHED BACK. FIG. 7—HIGH PRESSURE IS SUPPLIED ON THE WATER LINE BY A 4-INCH, 6-STAGE, MOTOR-DRIVEN, CENTRIFUGAL PUMP

neath the floor are two tanks, one 10 feet wide by 60 feet long and the other 15 feet wide by 34 feet long, each 12 feet deep. Together they hold 70,000 gallons. As the sand-laden water drains through the mesh of the floor pans into the first tank 3 feet below it encounters a series of seven baffles, made from ⅝-inch boiler plates. In order to catch the floating as well as the heavy material, the sandy mixture alternately passes over and under these baffles. Ninety per cent of the sand is collected by the first baffle. Some sand drifts over into the second section but none of the recoverable sand goes beyond.

Once every 24 hours a clam-shell bucket lifts the sand from the first two sections onto a tiled floor adjacent to the chamber. After 24 hours this sand is dry enough to go into the riddle for re-use. The fine silt and mud in the remaining five sections of the settling tank are removed only every two or three months, and a use for this material is being devised. By the time the water has traveled through the settling tank and has reached the pump it is clear enough for immediate reuse. The recovery of sand amounts to 40 tons a day, after drying. Rarely is this sand found to contain more than 7 per cent moisture after one day on the tiled drying floor.

Since the three roof sections telescope over a 15-foot space, the heaviest castings can be brought in by three of the six cranes which serve the main foundry building. To facilitate the work the smaller turntable is equipped with a dump plate on which a number of castings can be placed, and thus one lift in and one lift out account for three or four medium-size castings. Small work is handled in a basket which is set upon the smaller turntable.

After six months of actual operation the plan is declared to be a complete success. The main foundry at West Allis melts 6,000,000 pounds of gray iron a month. Most, but not all, of this work is cleaned in the hydraulic chamber. Some castings from the other foundries at the plant are cleaned, plus an occasional large steel casting from another Milwaukee foundry. While gray iron is the bulk of the tonnage handled, steel and brass castings have been cleaned with equal success.

Thus far Allis-Chalmers engineers have probably leaned over backwards in permitting large castings to cool, but water can be applied practically as soon as hand labor can be utilized. The cranes hook onto the arbors in the larger castings and pull them out intact; under the hand method they were usually lost, and the consequent saving is $30 to $40 per arbor. It is estimated that the saving in washing out gaggers and rods without breakage is $6000 per month over the hand method.

Formerly 60 men were employed to clean and chip. Now, two men suffice for the hydraulic chamber and 14 men chip and perform other tasks. The cost of water, from an artesian well on the company's premises, is negligible and no sand is lost. Thus far no casting has been damaged by high-pressure cleaning, though as high as 450 pound pressure has been utilized. A weighty factor is that dust and dirt have been eliminated.

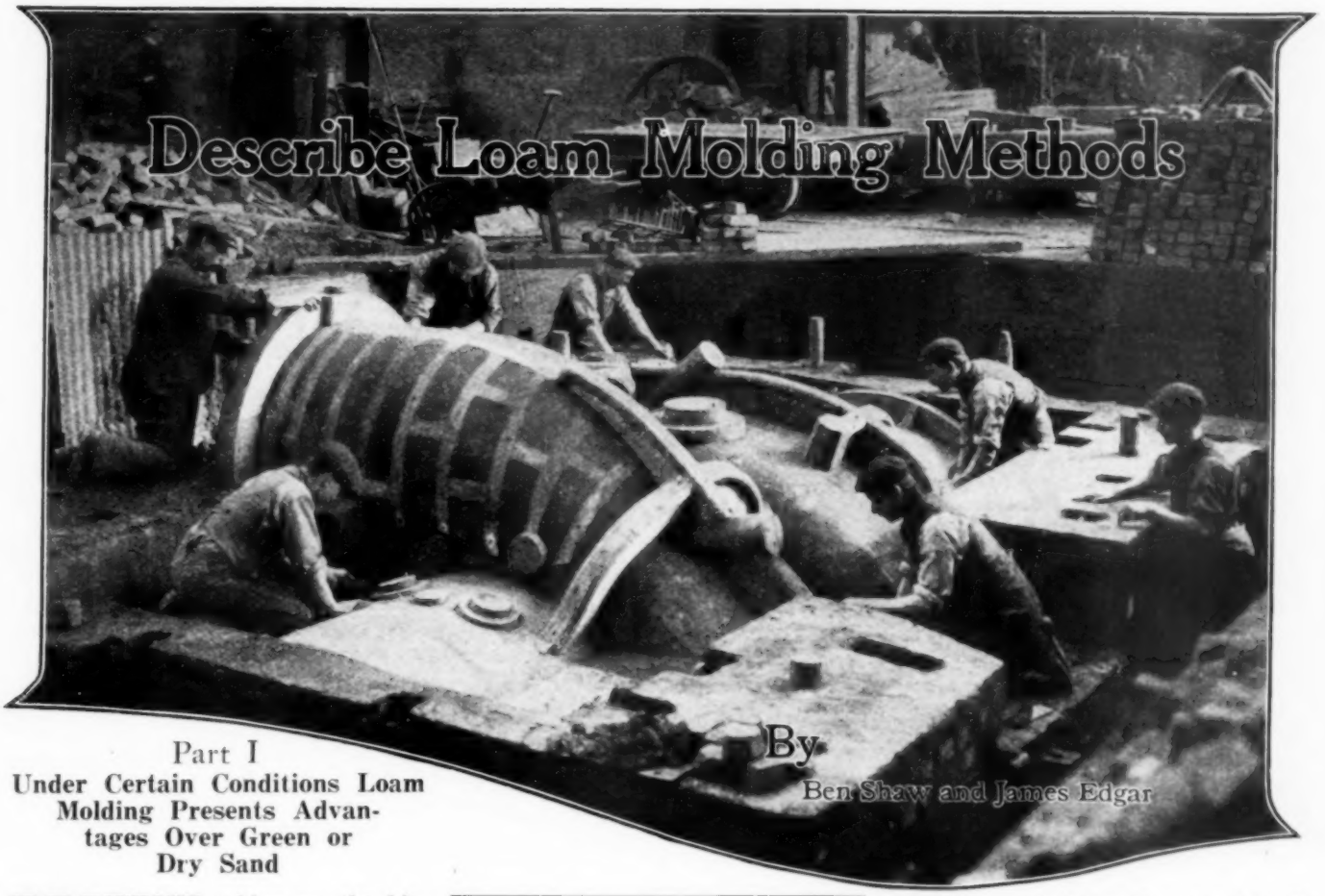
Except for the hydraulic elevator in the operators' house, which was manufactured by the Otis Elevator Co., and the Cutler-Hammer Mfg. Co. starter board, the chamber and its equipment are products of the Allis-Chalmers shops.

Southern California Sends Large Delegation

THE wide-spread appeal of the convention and exhibition of the American Foundrymen's association never was better illustrated than during the recent Syracuse meeting when the registration lists contained the names of men from all parts of the world. Southern California, the point in this country farthest removed from the scene of activities, perhaps had the largest delegation of any of the distant sections. Fourteen men, awake to the future of the foundry industry in Southern California, and desiring to partake of the valuable information dispensed at the convention, traveled nearly four thousand miles to attend the annual gathering. One enterprising member of the group succeeded in rounding up eleven of the fourteen at one time, and the picture here produced, was taken.

Bottom row, reading from left to right: Axelson, Axelson Machine Co.; Sutor, Western Machinery Co.; McLean, Snyder Foundry Supply Co.; Kellogg, Chamberlain Co.; Burgess, D & B Pump Co.; Olsen, Macauley Co.; Top row, reading from left to right: Nutt, Western Machinery Co.; Blackie, A. J. Bayer Co.; Patterson, Edison Electric Appliance Co.; Marchant, C. F. Braun & Co.; Smith, Layne & Bowler.

Describe Loam Molding Methods



By Ben Shaw and James Edgar

Part I

Under Certain Conditions Loam Molding Presents Advantages Over Green or Dry Sand

WITHOUT taking up the historical feature of loam molding it may be pertinent to point out that many foundrymen today who could adopt loam molding profitably for part of their work, are not aware of its advantages. They do not know large and intricate castings may be molded without the aid and expense of elaborate patterns. Loam molding was practiced extensively on all classes of castings made in European foundries during the middle ages and it is believed that the earliest British founders in Sussex also were loam molders.

The statement sometimes is made that the general tendency of modern foundry practice gradually is eliminating loam molding in favor of drysand molding, also, that the modern foundryman realizes more than his predecessors the value of green sand as a molding medium. This is true—within limits. Changes have been forced on the foundryman and adopted not because he believes that better castings can be produced by one method as compared with others, but owing to the general evolution of engineering practice which is slowly and surely eliminating the one-off job. The repetition foundry in a few years' time will have become the rule rather than the exception. In those departments of foundrywork where loam practice chiefly has been developed there is small likelihood of repetition methods ever being adopted. For example it is improbable that large marine and stationary engines ever will be standardized, and therefore always there will be scope for the loam molder. Loam has and always will have an economic value in the making of molds for which it is particularly suited. The use of loam molds for special types of castings not only cheapens but also may quicken production.

Loam can be put to quite a variety of uses in the foundry and loam molding is far more complicated and difficult than it is sometimes thought to be by those whose experience has been confined to drysand and greensand. Loam may be used to build a complete mold, including cope and cores, but sometimes it is better practice to construct the mold partly of loam and partly of sand. Practical reasons, such as the difficulty of locating small loose parts in a swept-up loam cope, render it advisable at times to make a loam pattern which can be used for making either a loam, drysand or greensand mold.

Loam molding presents both advantages and disadvantages. Special qualities are claimed for the process that render it indispensable in those foundries dealing with a wide variety of castings. The material is strong, plastic and needs no ramming. A cheap profiled edge board takes the place of a costly pattern. Loam is

Loam Molding Series

PUBLISHED description dealing with the loam molding branch of the foundry industry has been more or less fragmentary and confined to isolated instances. In a forthcoming series of articles of which this is the first THE FOUNDRY *will present the subject from practically every angle. The text will be illustrated by reproductions of line drawings made by the authors Ben Shaw and James Edgar, practical men who frequently have contributed in the past to the columns of* THE FOUNDRY. *Description will cover application of the process, materials, equipment, rigging, with sufficient detail in the construction of several molds to illustrate the basic principles involved and the points where the process varies from that employed in making sand molds. The various articles are based primarily on British foundry practice, but with the single exception of the method of preparing the material they also represent American practice. Natural loam deposits in this country obviate the necessity of preparing artificial mixtures.*

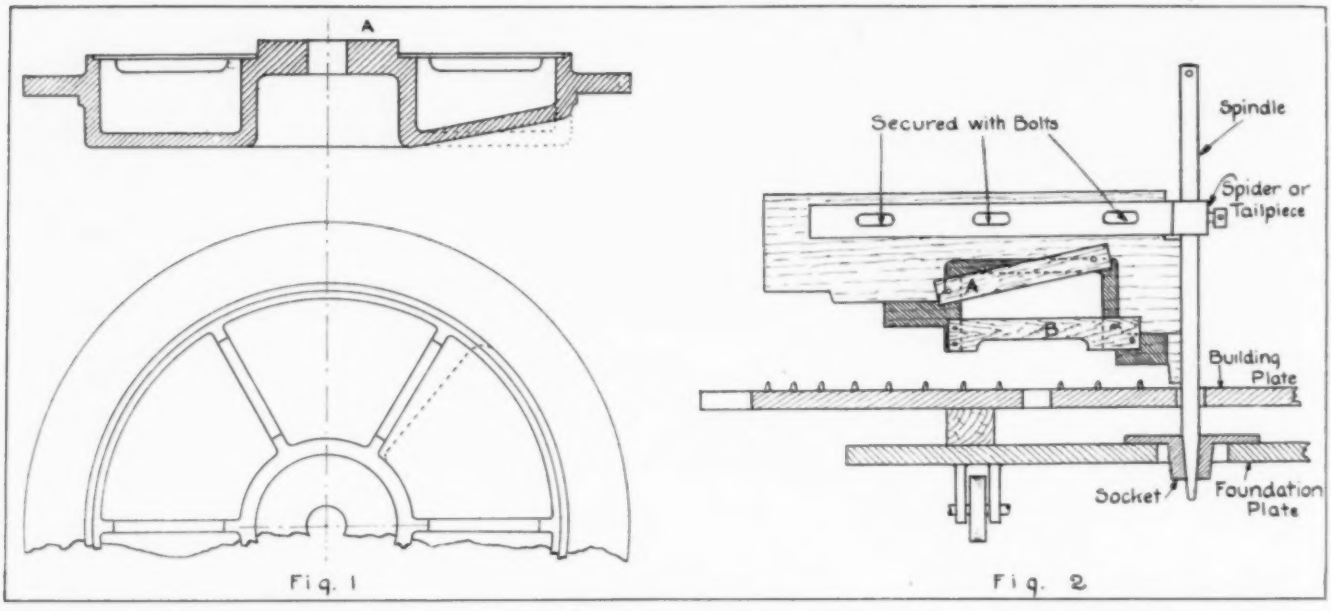


FIG. 1—CROSS SECTION AND PLAN VIEW OF A TYPICAL CASTING TO WHICH LOAM MOLDING IS PARTICULARLY ADAPTED. FIG. 2—SECTIONAL VIEW IN ASSEMBLED POSITION OF THE PRINCIPAL PIECES OF EQUIPMENT REQUIRED FOR THE LOWER HALF OF THE MOLD

not fragile in its plasticity like dry-sand mixtures and, as it contains more moisture, it retains the shape given to it. A loam mold can be made from a full pattern although it is not as convenient to use a full pattern as a skeleton pattern or boards.

The case against loam molding implicates patternmaker as well as molder. The patternmaker's work is not finished when he sends the boards to the foundry. Almost certainly he will have to visit the foundry to explain the boards and the design. Usually he has to be sent for several times while the mold is being made. Sometimes he is held responsible for setting the boards on the spindle. He may have to mark centers on the mold face for ribs, bosses, etc., and check these with trammels when the molder has fixed them in position. On complicated work his presence may be necessary nearly all the time the mold is under construction. While the patternmaker is busy, the molder usually is standing by. In propeller shops, where several molds are under way, this idle time may be reduced greatly because when a mold is ready for the patternmaker's attention, the molder works on an adjoining mold. Molders accustomed to the work can dispense with the services of the patternmaker to a considerable extent.

Deciding Type of Pattern

When a decision has to be made whether a full pattern and drysand, or a strickle or skeleton pattern and loam, should be made, the number of castings required should be an almost determining influence without considering other factors. When one or two large cylindrical castings are wanted, almost invariably it is more economical to cut out the pattern-making material and labor and make them in loam. If many castings have to be made a full pattern is justified in nearly all cases. With a full pattern the various branches and brackets can be checked carefully. Even with a sand pattern it is difficult to insure as great accuracy as is possible with a wood pattern. When a large number of castings are required, or repeat orders are certain in the future, it may be an ultimate economy to make a metal pattern. This pattern may be cast in dry or green sand, or it can be made in loam conveniently. In certain shops loam is used only for making master patterns where wood patterns would be weak in addition to being costly.

Successful loam work depends upon close co-operation between patternmaker and molder. Many jobs are made in loam which the patternmaker does not require to set down because he actually sets them down on the sweeping boards and the foundry foreman can check these before he assigns the job to a molder. The experienced loam molder is able to visualize quickly the design of the

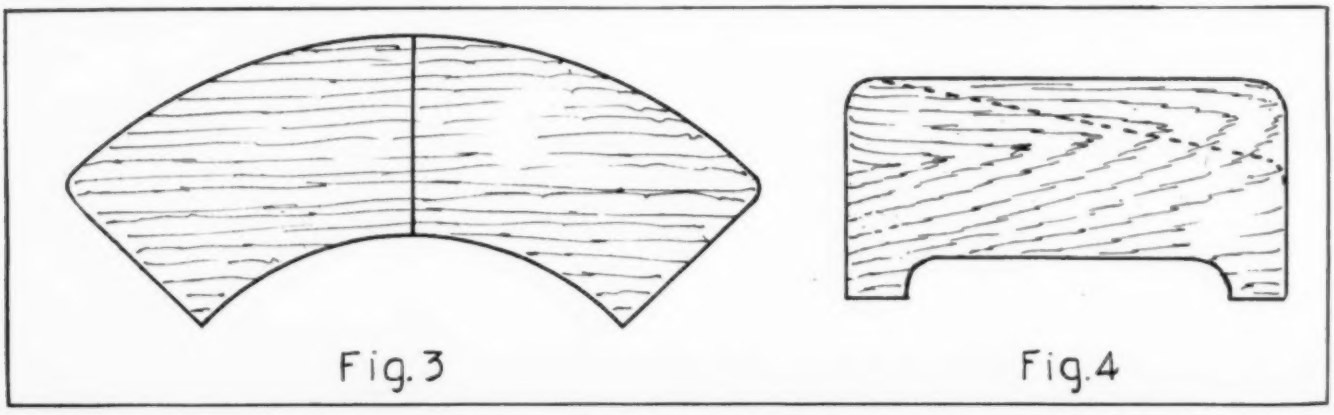


FIG. 3—TEMPLET FOR PORT CLEARANCE. FIG 4—ONE OF THE SIX RIB PATTERNS. WITH THE EXCEPTION OF THE SWEEPS THESE ARE THE ONLY PIECES OF PATTERN REQUIRED

desired casting. Indeed one of the greatest difficulties of the inexperienced molder is to plan and execute a job where he has no pattern and corebox to compare.

A loam mold involves the use of a base plate upon which the mold is built; a spindle, when the work is cylindrical; steel or cast iron grids to strengthen the mold and allow the parts to be lifted; and bricks to form the bottom, sides and top. Two loam mixtures are used for every mold. The finer mixture is used for the face of the mold. In addition to the building and facing loam a third mixture is used for cores. The common loam is equivalent to the floor or backing sand in dry sand molds, and is used like cement or mortar between bricks when building a mold. The surface of the mold which comes into contact with the metal is made of facing loam which is finer. Owing to the strength of these mixtures it is necessary to introduce openers that the molds may be sufficiently porous at the time of casting. For this purpose chopped straw, horsedung, saw dust or cow hair may be used. Many founders reduce the strength with ground coke, or sharp sand. Strong facings crack considerably on drying and great care has to be exercised later in filling these cracks to avoid corresponding marks on the castings.

Add Chopped Straw to Core Loam

Core loam is prepared in a similar manner but with a greater proportion of an opening agent. The material must be loose and friable, after the metal has been cast and in a condition to be readily removed from the cooled casting. A strong loam bakes hard. It will offer resistance to the natural contraction of the metal during the time of cooling and is extremely difficult to remove from the casting. Chopped straw or sawdust may be added to core loam. Sometimes common blacking also is added and this helps to disintegrate the loam after the metal has been cast by forming a loose, friable material.

Skeleton patterns often are used in loam molds but undoubtedly loam is more profitably used when patterns can be dispensed with altogether. When the entire mold can be swept to give the requisite shape, the amount of patternmaking involved generally is insignificant. However, this does not mean that what is supplied is necessarily of an elementary character. Greater ingenuity may have to be exercised even by the patternmaker than in the construction of a complete pattern. It does mean that what pattern work is necessary can be prepared in a fraction of the time required for a full or even a skeleton pattern.

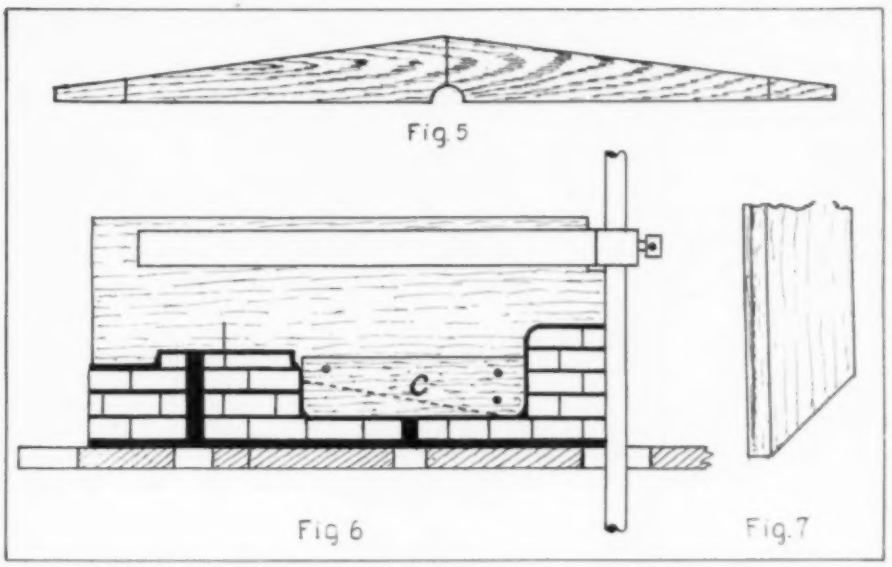


FIG. 5—THIS IS A GAGE STICK USED FOR CHECKING THE POSITION OF THE SWEEP AND THE DIAMETER OF THE MOLD. FIG. 6—MOLD FOR THE COPE IS BUILT UP AND SWEPT ON A PLATE. FIG. 7—THE WORKING EDGE OF THE SWEEP IS CHAMFERED

The question of relative costs is of interest. Owing to the considerable saving in the patternshop, more expense can be borne in the foundry. Cost of production necessarily covers both sections and for many classes of work the use of loam affects a considerable saving. Value of loam is most evident in making molds for cylindrical castings because cylindrical work offers facilities for sweeping around either a vertical or horizontal spindle and boards or sweeps form the principal medium for obtaining the requisite shape.

Just as the sweeping of molds is more or less specialized in the foundry so the making of the sweeps to a considerable extent is the work of a specialist in the patternshop. Even in those shops where much loam work is done, the uninitiated are lacking in knowledge of the most elementary principles involved in the sweeping of molds. Facilities are not always available for obtaining the necessary information and consequently in this and subsequent articles we purpose dealing with the subject in detail. We shall select representative castings that have been made in loam to illustrate the various methods generally used to suit particular designs.

A common type of cylindrical work is illustrated in Fig. 1 by a part plan and sectional elevation. It represents a form of cylindrical cover of which there are many modifications, but none involving special molding problems. In this example both top and bottom parts of the mold readily can be swept. Apart from the ribs and a template for the steamway clearance, only two sweeps and a gage stick are required from the patternshop. These covers invariably are cast in an inverted position from that shown in the illustration. No special reason exists for this so far as the quality and appearance of the casting is concerned because both top and bottom sides carry surfaces that are to be machined. It is more convenient to prepare the mold in this way. Once the patternmaker has decided, from previous experience or from instruction received from the foundry, which side is to be cast down he can proceed with the necessary pattern work.

Patternwork

Sweeps usually are prepared from 1¼ inch, or 1½ inch material so that they may be attached securely to the spindle arm when in use. The sweep for the bottom of the mold is shown in Fig. 2. In loam strickles the straight edge of the board corresponds to the edge of a drawing board. It is customary to measure all sizes from the edge and square all center lines from it. The reason, of course, is that with a horizontal board the molder can place his level on top of it and with a vertical board he can test it with a plumb bob. When it is inconvenient to make a strickle in this way a strip usually is screwed to the board on which the molder can place his spirit level. The sweep is shaped to follow the contour of the main part of the casting as far as the joint, that is under the flange, where at a convenient distance from the circumference, usually about 3 inches, a recess is cut to form a guide for the cope. The contour of the

casting is not uniform throughout. Part is cut away for steamway clearance and therefore a strip of wood should be attached temporarily to the sweep as indicated at *A* to define the modified shape. Sometimes thin hardwood is used for this purpose. During the process of sweeping this part of the mold it is necessary to introduce six ribs and as these are difficult to set accurately without a definite guide, a suitably shaped strip of wood should be attached as at *B* to form a seat. A joint is necessary at this point if the cores must be lifted after they have been swept.

When the diameter of the spindle is known, the sweeps may be cut in the pattern shop to fit accurately but, as a rule, it is better to make them the full half diameter of the job otherwise errors are likely to occur. The center should be marked clearly *CL* so that the molder will make no mistake. The sweeps then may be cut at the foundry to suit the spindle. The central hole in this casting is comparatively small, hence the bottom sweep is shaped to form a print for a small loose core. If the diameter of this hole exceeds 6 inches it might be formed with the sweep.

In good practice the bottom sweep shows the thickness of metal. The half section is drawn as indicated in Fig. 2 and painted and varnished so that it can be seen distinctly. Good practice also indicates machined faces. This section frequently is supplemented by a small plan view of the casting to show the positions of the ribs and also the position of the steamway clearance. A thin piece of wood *C* is attached temporarily to the face of the sweep to follow the contour of the steamway clearance. The practice is recommended as there is then no necessity for having a blue print in the foundry. The cope sweep, Fig. 6, is made on a similar principle, but it is cut to follow the contour of the steamway clearance, a thin piece of wood *C* is secured temporarily to the face of the sweep to follow the shape of the main part. The guide at the circumference must be cut to coincide accurately with that formed by the bottom sweep. The sweeps are chamfered in the manner shown in Fig. 7 to facilitate sweeping.

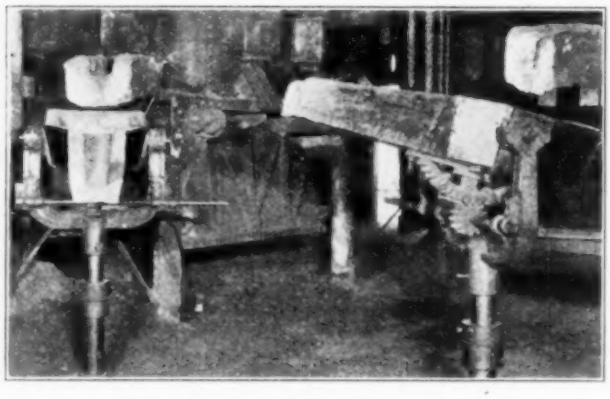
The majority of holders like a sweep rotated clockwise, where the sweep is grasped by the left hand and the loam is applied with the right. The remainder prefer working in the opposite direction and therefore it is advisable to chamfer the sweeps to suit the direction of rotation favored at the foundry doing the work. Six pattern ribs are necessary, five cut to the main shape and one cut for the steamway clearance as shown in Fig. 4. They should be cut to allow clearance for the sweep in passing over them. If the patternmaker makes them the right size the molder will cut from 1/16 to ⅛ inch from the top and ends before he sets them in place. The part which rests on the bearing is not touched. A gage stick Fig. 5, though not essential in this instance nevertheless should be supplied. It should not be less than ¾ inches thick and cut to represent the correct diameter of the mold. In this case the gage stick may be used to check the sweep after it has been set and also the completed mold. It is invaluable when marking the center for ribs, etc. The semicircular hole should be cut to suit the diameter of spindle to be used and it should be cut accurately in the center of the stick. It is not uncommon practice to screw a check piece on the sweeping board at a distance from the center and make the gage so that, when the board is correctly set, the gage butts against the inner end of the check piece. In this particular instance a template should be supplied to determine the amount of steamway clearance. Thin material will serve and the center should be plainly indicated. This precaution is only necessary on the cope side.

The Norton Co., Worcester, Mass., has opened an office and salesroom at 338 Third avenue, Pittsburgh. Ralph O. Anderson is in charge.

Designs Tilting and Revolving Reservoir Spout

SEVERAL interesting features are connected with the tilting and revolving reservoir spout device submitted by D. McDaniel, Hamilton Foundry & Machine Co., Hamilton, O., in connection with the Obermayer contest conducted by the American Foundrymen's association. That company found it necessary to tap the cupola into a 1500-pound ladle suspended from a bridge crane and into several 500-pound ladles traveling on a trolley. A mixing ladle had been used, and the trolley arranged so that the iron could be poured directly from the mixing ladle to the other ladles. However, the necessity for hotter iron suggested the elimination of the mixing ladle and the pouring into the smaller ladles from the cupola spout. This meant stopping the cupola after each ladle was filled, or cutting into the stream of molten metal with the unwieldly 1500-pound ladles. A double tilting spout, commonly used in foundry practice, was considered, but a device of this nature could not be placed to serve satisfactorily the crane ladles and the trolley ladles.

To overcome this difficulty, the tilting and reservoir spout, shown in the accompanying illustration, was designed. The device consists of a special spout mounted on a revolving trunion. The discharge end of the spout is of usual dimensions, but the portion at the back is widened out so that a quantity of metal may be carried in the reservoir thus formed, when the spout is tilted upward. This arrangement allows the flow of iron from the cupola spout to accumulate in the tilting spout long enough to change ladles or to turn the spout from the filled ladle to the empty one. With minor changes this apparatus may be used to pour molds direct from the cupola, where the molds are delivered to the pouring station on conveyors.



Correlating Gray Iron Tests-II

Gray Iron Composed of Four Structural Components, Namely Pearlite, Ferrite, Graphite and Steadite — Size and Grain Structure Found Microscopically

By John W. Bolton

Many Test Methods

In this, the second part of the annual exchange paper prepared by J. W. Bolton under the auspices of the American Foundrymen's association for presentation before a combined session of the Belgian and French foundrymen's associations held in Paris, Oct. 25, the author describes the several methods by which cast iron usually is tested. In a summary he points out that while the amounts of the four major components pearlite, ferrite, graphite and steadite may be approximated closely from analysis still the sizes and distribution of the grain structures are determined best microscopically.

FROM study of data it is evident that lowest strength for any given iron occurs when the iron is in equilibrium. When in equilibrium, that iron which possesses lowest carbon content and smallest grain size will have the greatest strength. Highest usable strength is attained when primary graphitization is completed and before further grain growth can take place. Of any two irons at this point that with lower total carbon is usually the stronger. Fig. 9 is a qualitative representation of the effects of section size on strength.

Since shrinkage usually takes place close to the neutral axis, its effect on transverse strength is negligible. Shrinkage is an important factor in tensile tests from centers of heavy sections. Experience of this laboratory indicates that heavy cylindrical sections poured cool have a tendency to pipe, showing shrinkage in the upper central portion. While such shrinkage may be almost invisible to the naked eye, it has a profound effect on the strength. For this reason heavy test bars should be poured either at a definite temperature, or at the temperature at which the corresponding castings are poured.

There is no logical transverse-tensile ratio. The practice of using such a ratio is equivalent to making comparisons of different irons. The ratio varies widely for different irons. It is the author's observation that presence of either whorl or uniform flakes indicates that the ratio will be about 7½ or 8 to one in the 1.25-inch diameter A. S. T. M. bar, whereas when dendritic segregation is prevalent the ratio may be higher.

While transverse tests probably give the most satisfactory idea of the strength of the section as cast, the tensile test gives a more accurate and certainly more conservative figure for the strength of parts where finish allowance has been large.

In the brinell ball hardness test a spherical ball of hardened steel 10 millimeters diameter is driven into a polished metal surface, the pressure being obtained either by a system of weights and levers or by a hydrostatic press. The same pressure is used each time, so that the area of the indentation is proportional to the metal's resistance to indentation. In gray iron the brinell number is a fairly good indicator of the tensile and transverse strength, the crushing strength and machinability. However, its use must be tempered with discretion. In Fig. 10 the brinell-tensile curve shows increase in tensile strength from 100 to about 220 brinell. The heat treated bar's curve is close to the sand cast bar's curve in the upper ranges, but departs more widely from it in the lower ranges, largely due to differences in grain size.

The brinell numbers of low to high strength sand cast irons are about the same as those of low to high strength annealed carbon steels, that is, from 100 to 200. The approximate brinell of ferrite is 100, while the brinell of pearlite is about 200. From this it is seen that brinell on gray irons tends to follow the amount of combined carbon, rather than to indicate the degree of discontinuity caused by the graphite flakes. While the flakes afford weak lines of rupture for tensile and transverse stresses, they apparently have much less effect in lessening the resistance to indenta-

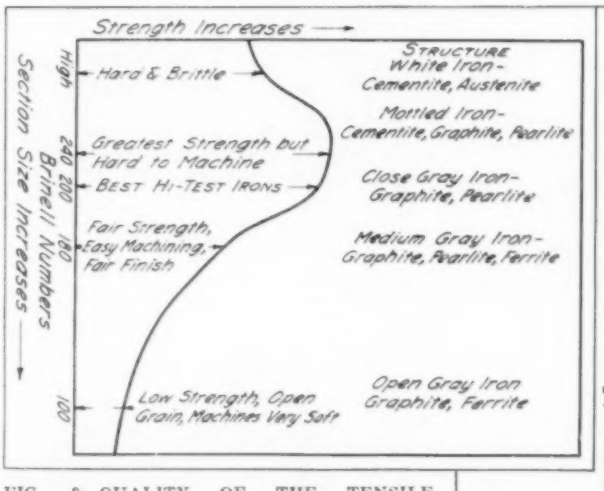
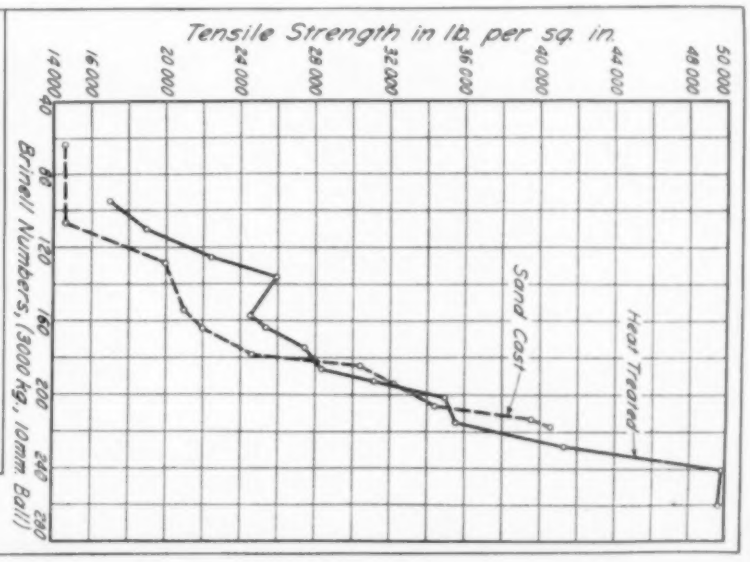


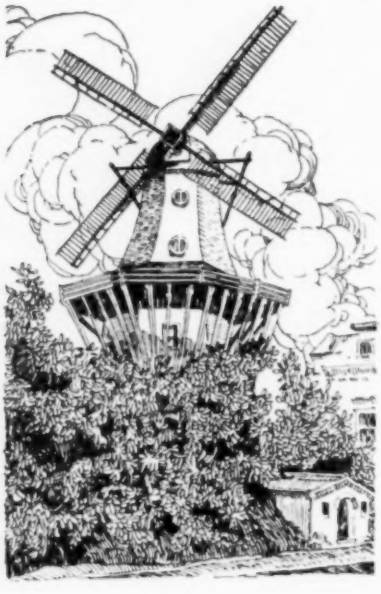
FIG. 9—QUALITY OF THE TENSILE STRENGTH AND SECTION SIZE. FIG. 10—COMPARISON OF BRINELL HARDNESS WITH TENSILE STRENGTH



Around the World with The Foundry

Little Journeys to the homes of our readers

Holland



FOR centuries Amsterdam has held the premier position among the few diamond cutting centers of the world. Uncut diamonds from the hoards of Oriental Potentates, diamonds great and small from the South African Rand and from the diamond mines of Brazil have poured, dim and lustreless into her strong boxes for generations to emerge later from the hands of her cunning and skillful artisans flashing in a thousand points of iridescent light and flame.

Shut off from the sea by immense dikes the country is traversed by over 1000 miles of intersecting canals over which a considerable part of her commerce is carried in summer. The densely populated great manufacturing centers find additional transportation facilities in over 2000 miles of railroad.

Peter the Great of Russia learned the trade of a ship wright in the Netherlands, at that time one of the great maritime nations of Europe. Ship building still is carried on to a considerable extent in the kingdom. Other industries include iron and steel works, breweries and distilleries, glass factories and potteries.

The first iron hollow ware was made in Holland and her present day exponents rank high in the list of men engaged in the ancient and honorable art of casting in metals. THE FOUNDRY is read twice a month by the staffs of 21 out of the 80 casting plants in the country.

"Wherever metals are cast you'll find THE FOUNDRY"

tinuous, and it is probable that the breaking stresses are transmitted in a series of jerks rather than as a smooth action along the slip planes. This explains how, due to its discontinuity of structure, gray iron shows no tendency to *neck* in the tensile test and possesses slight malleability.

Summary

Correlation of data on structure of gray iron to data on physical properties indicates numerous relationships. Gray iron is composed of four major structural components, pearlite, ferrite, graphite, and steadite. While the amounts of these components can be closely approximated from analysis, the sizes and distribution of their grain structures are determined best microscopically. Characteristic properties of these components follow:

Graphite—weak, soft. Fracture follows along graphite flakes, yet these flakes offer considerable resistance to compression. The graphite first forms *in situ* from the cementitic areas. Grain growth may obscure the characteristic formations of the primary flakes. The flakes may occur in long dendritic formations indicating lower carbons, in whorl or rosette formations (indicating ledeburite—flakes could be termed eutectic graphite from this formation) or in coarse, broad, plates which indicates primary cementite, hence high carbon. More graphite promotes lower strength. Where grain size is large this effect is most pronounced. From 30,000 to over 250,000 flakes per square inch were found in various samples examined by the author. Hence total carbon has its greatest effect in heavy sections. Graphite flakes cause the *open grain* appearance of gray iron. This appearance can be modified by the machine finish. They also account for the absence of elasticity and, in part, for the low resistance to shock.

Pearlite—strong and moderately hard. All highest test irons are nearly or entirely pearlitic or other transition forms but the converse is not true. Brinell around 200 usually indicates pearlitic matrix. If this is accompanied by low carbon high strength can be expected.

Ferrite—fair strength, softer and more ductile than pearlite. Sand castings of high ferrite commonly are weak, as conditions which promote this formation also promote grain growth. Annealed ferritic castings may have fair strength if small grain size is retained.

Steadite—brittle, abrasive. Strong irons can be made readily without high phosphorus. Due its abrasive qualities, steadite reduces machinability. In some castings, notably sugar mill rolls and automobile cylinders, a certain amount of this hard component is claimed to have a beneficial influence. Microscopic study of fractures shows why phosphorus decreases deflection and resistance to shocks. In amounts 0.20-0.90 per cent phosphorus the author sees little difference in fluidity. Phosphorus seems to have some effect on the ease of decomposition of cementitic forms. This is illustrated in Fig. 14. Sulphides also hinder graphitization, as shown in Fig. 18. Phosphorus also influences the absorption of carbon.

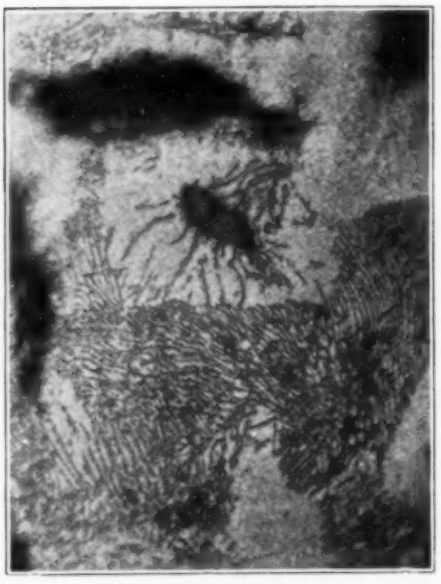


FIG. 18—PEARLITE SEEMS TO BE DECOMPOSED ONLY WITH DIFFICULTY AROUND SULPHIDE INCLUSIONS. MAGNIFIED 484 DIAMETERS. ETCHED WITH PICRIC ACID

So far in this paper the author has given data on physical properties of irons of various analyses and under various conditions, the relationship of this data to structural forms in the iron has been explained, and a number of remarks made on relation of engineering properties to other properties. What practical value is this to the foundryman and what helpful suggestions can we get out of it?

Some fundamental metallurgical principles have been stated. Study of such data causes one to study his own metal, not merely as something to fill a mold, but as a worthy engineering material. Most experimental study has been done by means of test bars. Most foundrymen know what their metal will break at in standard bars. What stresses will it resist in the castings? The only way to find out is to get data along the same lines this and other laboratories have done. Try out different sized bars, different analyses, and different pouring temperatures. Once in possession of this information one can stand back of his material and sell quality as well as quantity.

It is highly desirable to know what iron will do in different sections. To have a specification test bar for every section is another matter. In theory it is fine, in practice not so good. For all ordinary work, bars 1.2 inches diameter serve well. In castings of *uniformly* heavy section it is desirable to have a large bar because the smaller will chill. The large bar must be poured at an exact temperature and if 4-inches diameter will require a 100,000-pound machine to break it between 12-inch supports. Most castings have sections of varying size. There the metal is determined by the smallest section. In few castings the minimum section is under 2 inches. Personally, the author would be satisfied with the present standard bar for all but heavy castings. In this latter case he also would want to know the amount of silicon and carbon present.

Getting Clean Iron

Question—We receive a great many small orders for automobile pistons and have trouble in getting clean castings. We buy a high grade of pig iron and use only such scrap as gates and bad castings from our own foundry.

Answer—A special grade of iron ranging from 0.18 to 0.2 per cent phosphorus, known as malleable bessemer, should be used for making pistons. This low-phosphorus iron prevents internal shrinkage, which is a potent cause of porous castings. Other precautions which are taken in making these castings are to flux the cupola with 30 to 50 pounds of limestone per thousand pounds of iron and to use strainer cores in the gate. These cores consist of flat disks with 3/16-inch perforations. Strainer pieces consisting of perforated tin plates also sometimes are placed over the opening of the down gate to retain the iron in the pouring basin until a pool is formed there to float the slag.

Purchases Business

The Air Preheater Corp., New York, has purchased the business of James Howden & Co., of America, Inc. New York, with works and foundry at Wellsville, N. Y. The new company will further the sales and manufacture of an air preheater for use in connection with steam installations.

Selling Technical Graduates Possibilities of Foundry Field

Undergraduate Must Be Given Some Incentive To Prepare Himself for Work in the Foundry If More Technically Trained Men Are Needed and Desired in the Industry

By R. R. Meigs

RELATIVELY few men enter college with a definite idea of the work they will attempt upon graduation. In a technical college, the undergraduates naturally tend to become interested in the various industrial fields, in most cases the branches of industry particularly attractive or interesting to the undergraduate frame of mind being chosen. These selections are influenced usually by what may be called the general conceptions of the possibilities for advancement within the different fields. Working conditions, preliminary training requirements, financial returns and so on are other deciding factors.

Some industries are well advertised in more than a commercial sense as they are known to offer definite opportunities in their special fields. Others possess an over-all unattractiveness, equally well known, but which often is more or less superficial or assumed. The undergraduate has no basis of real meaning or value to use in comparing the openings available. In most cases he does not possess a fair understanding of the actual conditions or opportunities offered him in his final selection.

In late years some of the large manufacturing companies have sent representatives to various colleges to speak before the members of the graduating classes and to describe the training and the positions available within their organizations. These informal talks are of considerable interest and actual assistance to the student in determining his first move. Their continuation and increasing scope seem to indicate that such a policy has proven effective from the employer's point of view.

Present No Organized Appeal

Among the industrial divisions employing technically trained men it may not be said that the foundry industry affords a special incentive for the undergraduate to prepare himself for a start in that direction. The need of technically trained executives is described frequently in the columns of the associated trade-journals and in the proceedings of the related associations. The validity of these statements seldom is questioned. However, outside of these sources there is little publicity attending the opportunities available for college trained men within the foundry. Undergraduates, who are unfamiliar with recent developments in the industry, possess an out-of-date conception of conditions within it, and almost involuntarily, they turn to other fields of endeavor.

If an accelerated influx of college trained men is desirable in the foundry industry, an organized publicity program would tend to bring it about. College classes would serve readily as agencies through which necessary contacts could be made. The fact that there is an ever increasing application of engineering practices to all phases of foundry procedure in itself will attract some graduates who may chance to be acquainted with particular instances. However, the majority of the average graduating class must be told what an interesting place an up-to-date progressive foundry may be.

Engineering colleges and schools, as a rule, offer a course in foundry practice. Some of these naturally are more comprehensive than others. These courses at the best only serve to familiarize the student with the major foundry operations, the working tools, shop terms and the like. They can not reproduce in themselves all the requisites or the organization existing in a commercial shop but up to a certain point they may be of real benefit. The serviceability of these courses is increased greatly by incorporating a number of inspection trips through the more progressive foundries of the locality. Another interesting feature is a series of lectures or talks given by foundry executives upon subjects pertinent to the development of foundry operation and technic.

Definite Schedules Needed

Let it be assumed that a graduate of a technical college enters the employ of a foundry organization and it is agreed that he shall spend a certain period of time in training. It seems advisable that a definite schedule should be drawn up outlining the student's progress through the various departments of the shop. Such an arrangement insures the student of an all-around experience and eliminates confusion and delay in shifting from one department to another. The writer spent two years working in practically every department of a large steel foundry under the direct supervision of his shop superintendent.

The only worth-while way for a foundry student to break into the work before him is to start as a helper of some sort. The first problem which confronts him is that of getting into personal contact with the particular group of workmen with whom he is to work. The success of the whole venture, in some cases, is affected by the outcome of these first encounters.

Graduates Avoid Field

WHILE many technical schools require a certain amount of foundry work in connection with engineering courses, the time given to this work necessarily is limited and the student only obtains a slight knowledge of foundry terms, tools, and operations. Recently several schools have arranged to devote a short period of time to the study of foundry costs and management problems. However, insufficient time is devoted to developing the possibilities for the technical graduate in this industry, and consequently few engineering graduates are entering the field. The author of this article, which was presented at the Syracuse, N. Y., meeting of the American Foundrymen's association, Oct. 5-9, has related the many impressions which developed during his two year training period in a steel foundry after graduation from a technical school.

With some groups the task is a delicate one; the least over-reaching and the green hand is in difficulty. In other groups, there is a cordial atmosphere from the first and breaking in becomes a new and interesting experience.

Not until a sound personal contact is made may the student hope to obtain any amount of real first hand information. Only when he becomes a full-fledged member of the group will he have their confidence and good will. The ordinary workman is willing generally to become an instructor provided the student will adapt himself to the teacher's method. The actual process of adjustment is influenced by a number of factors governed by the individual shop organization and personnel. The student should accustom himself to conforming with established customs as he finds them to obtain the maximum benefit from his training.

When the student succeeds in acquiring an acceptable background, the really profitable part of his apprenticeship begins. His workmen friends will commence to talk shop with him. Most of them have interesting stories of their personal experiences in earlier days and in other shops. The helper status gradually will be transformed until he generally is described to newcomers as, "a young fellow picking up the business." In the writer's opinion this is the ideal attitude. Under such conditions the student may be allowed really to assist an old-timer draw a pattern or cut a gate. The significance of such achievement is not in the student's acquired skill but lies in the fact that the student has been accepted as an associate by a workman and in a normal, natural manner.

Work as Molder's Helper

A foundry student may be given a job of his own at the start and given special instruction but such an arrangement is apt to work hardships and become unpleasant. It prevents the student from catching the shop morale and from getting an idea of the viewpoint possessed by workmen in general. By working with a man and coming to share in an impersonal way his tasks and duties it is possible to get an insight into his thoughts and problems. It gives one an opportunity to size up the industry from the standpoint of those who work for a daily wage. The student with a little effort may get their notions of matters pertaining to management, industrial development and working conditions. He may learn to discriminate between a good workman and one who is inefficient. This sort of experience and its attendant information is invaluable to a college graduate, and in general, is more difficult to obtain and appreciate than a working knowledge of foundry practice.

While a student is serving his time on the floor there are times when the novelty of the situation wears away. Routine with hard work may become monotonous. The biggest stay on such occasions is an interested member of the management who keeps in more or less direct touch with the student. A conversation relating to shop problems or proposed improvements will give the beginner something to think about other than the weight of a shovel of sand. Such discussions provide the student with an outlet for any ideas or information he may have acquired. They also give him an opportunity to straighten out any possible misinformation.

From the foundry student's point of view there are three general classes into which foundries may be divided. The first group contains those foundries which are modernized wholly. A large portion of these are production shops with specialized equipment and elaborate labor saving devices. The second class includes those shops which may be described as being in a transitional condition. In these foundries old rigging and methods are being gradually replaced by new equipment and improved methods, as these developments prove themselves to be truly practical and economical. The third division embraces the remainder, or the shops which are backward in accepting the results of recent industrial progress.

To the writer's mind, a foundry in the second grouping mentioned offers the best facilities as a training place for a prospective foundryman. In this type of shop there is enough of the earlier day practices discernible to enable the student to visualize somewhat the conditions existing in those days. The subsequent developments sometimes may be traced by examinations of discarded equipment laying in the scrap-pile.

In the personnel of the organization there are bound to be men who have had a great amount of practical experience in a wide variety of lines. When new equipment or methods are being considered, these men through their criticisms are valuable sources of information. Personal prejudices often turn out with considerable solid foundation. In such an atmosphere, provided, of course, that he is permitted to enjoy it, a student may pick up a fund of general foundry information outside of that obtainable from his own observations and experiences. This advantage becomes more apparent in cases where the shop does more or less jobbing and includes work of different types.

Thus the characteristics of the various groups determine the scope and nature of the training available. The fundamental ideas and impressions which a student acquires of the industry as a whole are dependent upon the same factors. A training complete in one particular class is not exceptionally comprehensive. To obtain a general conception of the industry it is desirable that a training course include a number of inspection trips through outside foundries of different types. These visits do more than increase the foundry student's information; they assist him in classifying and appraising that which he may already possess.

Results From Training Courses

Just what results may be expected from a training course is a matter which perhaps is of more actual concern to the student than to anyone else interested. The time involved, in addition to the four years spent in college represents a heavy outlay. The factor of first importance in the final result and one which depends largely upon the student himself, is the extent to which he has fitted or adapted himself to foundry requirements. It might be stated as the extent to which he has been adopted by those responsible for these requirements.

After spending some time in a foundry a student ought to arrive at some conclusions regarding his chances of making good. If he elects to stay he should select some phase of the work which interests him particularly as a specialty. The type of college training he received may have considerable bearing on his choice. He may become interested in the metallurgical operations, or in costs and production, or in the managerial side of things. There is the field of research for those who are inclined to the scientific or theoretical. The work of a consulting foundry engineer may interest another. The actual information or technic obtained through an intensive training may be discounted because of the lack of experience behind it. The effects of a technical or college training must be tempered by a foundry-sense which may be said to prevail among all good foundrymen. Under such conditions, the earlier the foundry student succeeds in establish-

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Recounts Experience with Steel Melting Units-I

By John Sonnenfeld

MR. SONNENFELD was born in Bosnia, a former Austro-Hungarian province, in 1883, and was graduated from grammar and high schools in Bosnia and Technological institute in Vienna, Austria. He then held the position of chemist and metallurgist in Hungary and Italy and was in charge of the La-Brugeoise, a prominent steel plant in Bruges, Belgium, for six years.

IN 1913 he came to America and took charge of rebuilding the crucible foundry at the Reed Foundry & Machine Co., Kalamazoo, Mich., where he installed a converter and equipment and later supervised foundry operations. He was with the St. Louis Steel Foundry Co., St. Louis, for several months making manganese and high carbon steels.

HE WENT to Lima, O., in 1915 and built and operated a new steel foundry for the Lima Steel Casting Co. During the war he established the record of making 434 tons of good castings in one month with a one-ton converter and a 32-inch cupola. He left Lima in 1923 and now is connected with the Mathews Steel Casting Co., Cleveland.

DURING the world war the converter ranked second in the tonnage of castings produced, the open hearth being first. The greater portion of the castings produced went directly or indirectly to the United States army or navy and while the specifications on analysis and physical properties were strict, little trouble was encountered in meeting them. Since that time some general improvements have been made on the process. Many of the complaints against the converter process may be attributed directly to the human element in industry. Converters have been operated by men who, in many cases, are not sufficiently instructed or trained or are not capable of handling the equipment with alertness and skill. Plenty of stumbling blocks develop in connection with the operation of the converter.

The process begins at the scales on the cupola platform. Making up the cupola charge is of great importance. To the writer's knowledge, the detrimental influence of sulphur in steel always has been appreciated, but wrong methods have been used to keep the sulphur content as low as possible. Low sulphur scrap, such as forgings, structural steel, boiler plate, etc., generally is low in carbon and manganese. In charges of 40 per cent pig iron, 35 per cent of outside scrap and 25 per cent of own shop scrap, the total sulphur charged will not exceed 0.04 per cent, figuring the returned shop scrap as high as 0.08 per cent. On paper it appears that the cupola iron will come down low in sulphur, but with such practice the cleaning room foreman soon will report cracked castings in increasing quantities.

If a regular laboratory is not maintained by the foundry, the steel samples should be sent to a chemist for testing. In the case just mentioned, the chemist may report sulphur as high as 0.12 per cent. The question naturally arises, what causes this large increase? Low carbon, low manganese scrap requires a higher melting temperature. Consequently, more coke must be charged to get the cupola iron down hot enough. More coke means more sulphur, which will be absorbed quickly by the iron with a low manganese content. A manganese of about 0.8 will absorb a part of the sulphur by forming manganese sulphide, which goes into the slag.

In recent years sulphur has been treated successfully with sodium hydrate and carbonate products, which, it is claimed, eliminate in the neighborhood of 60 per cent of the sulphur from the iron. If the iron melts down with 0.08 per cent of sulphur, a treatment with such a compound should reduce the sulphur content to about 0.035 per cent. The sulphur in the steel should not exceed 0.04 per cent, the increase being caused by conversion losses in the converter, these losses increasing the sulphur content about 15 per cent.

One drawback connected with this process arises from the difficulty in skimming the thin film completely from the ladle, and some of this basic slag may reach the converter to corrode the acid lining.

Phosphorus may be held stable by using low phosphorus pig iron and scrap. The content may be held to 0.04 per cent as there is no absorption or oxidation. An increase of about 20 per cent from the original charge

results from melting losses in the cupola and conversion losses in the converter.

The silicon content may be varied widely. Converters of two tons and more operate with a silicon content of about 1.4 per cent, while smaller units of one ton or less should use iron with a silicon content up to 2 per cent. If smaller castings are to be poured in the first case, 50 per cent ferrosilicon must be added after the appearance of the first flame. However, for floor work, and if poured with a bottom poured ladle, a silicon content of 1.4 to 1.5 per cent will give satisfactory results. Other conditions being correct, sound castings will be poured with such a heat.

Blowing requires considerable skill. Too much iron necessitates turning back the converter to a greater angle. This practice necessitates a longer time for blowing the heat and the losses due to boiling and splashing are much greater. Trouble may arise with the tuyeres plugging up when the converter is being set in position or during the first period of blowing, due to high silicon in the metal. In both cases excessive losses from violent boiling will result and sometimes the last flame will not be distinct and the converter will be turned down too soon or too late. The former will cause hard and the latter over oxidized metal.

The superintendent or the man in charge of the converter shop must be a good converter man. The steel blower may be a good man on the job, but often he is not familiar with the processes taking place inside of the converter and depends on the superintendent for advice in case of trouble.

Without going into the details of the converter blow process, it is safe to say that a 2-ton heat should be blown in from 14 to 16 minutes, providing conditions are right. The wind pressure should be around four pounds. If longer time is required to blow the heat, the trouble may be due to a high silicon content, tuyeres in bad shape or plugged or not tight, thus letting in air. If the heat comes sooner, the silicon is low, this condition often resulting in cold steel. A white smoke and light flame should come out of the mouth of the converter during the end of the second melting period.

White smoke and flame should be quite intense when light castings are to be poured, otherwise more 50 per cent ferrosilicon must be thrown into the ladle. Under normal conditions the end reaction is sharp. A last violent boiling in the vessel accompanied by a long, bright flame appears for about 30 seconds. The flame then drops suddenly, brown fumes being given off and gargling noises noted. The vessel is turned down quickly, the blast turned off, the heat being ready for final additions. After the additions, the metal lays quiet in the converter, being covered with a heavy coat of slag. The metal now is ready to pour into the ladle. The slag is inactive and possesses a high surface tension, serving to cover the metal in the ladle and thus avoiding extreme radiation of heat. This prevents the metal from cooling too rapidly.

Final additions generally consist of 50 per cent ferrosilicon and 80 per cent ferromanganese. Carbon is added by pig iron or cupola iron, depending on the amount of carbon required. Aluminum seldom is used in the converter shop.

Hundreds of consecutive heats may be made in the converter with little variation in analysis. No trouble should be experienced in meeting the specifications, for at the time the converter is turned out the metal has boiled so thoroughly that there is little more than an overoxidized iron left which contains about 0.08 per cent carbon, 0.08 per cent manganese and about 0.05 per cent silicon. Therefore the additions made simply are a matter of routine and the amounts are calculated easily.

Selling Technical Graduates Foundry Field

(*Concluded from Page* 963)

ing a definite goal, or line of attack, the more effectiveness he may command at the completion of his training.

A relatively small amount of actual foundry experience is possible in one or two years of training. Thus it is only when a reasonable result is expected and due allowances are made on both sides, that a foundry training will turn out with satisfaction to all parties. A college trained man should be able to assimilate detail and routine more rapidly in essence than an untrained man. A technical education supplies a special kit of working tools and some insight into the facts is back of many rules-of-thumb. After a period of training, say two years, the average graduate under interested supervision should be fitted to assume a position carrying a portion of responsibility. The exact position wherein he may be of most real service depends upon the individual foundry, its personnel and its problems.

The foundry industry is said to be in a stage of constant development. This progress may be said to consist largely in the evolution of mechanical equivalents for manual labor, the elimination of waste and the improvement of the final product. Such a development creates a proportional need for technical knowledge and should automatically increase the foundry demand for technically trained young men. At present, when foundry expansion is becoming so rapid and is breaking so sharply away from the past, a lack of contact with earlier practices cannot be held at a complete or extremely serious disqualification. Practical experience, with its beneficial information, is of prime importance, but it is something accumulated through years and no training course provides a short-cut. The obligation of a student in a foundry is to fit himself to carry on the work of foundry development. To do this it is necessary that he become acquainted with certain well established principles which the past has proven inviolable. After this step, under favorable conditions, he should go on acquiring experience and knowledge from his own efforts and the developments of his time.

Tentative Standards Are Published

The American Society of Testing Materials has issued the 1925 edition of tentative standards. This book is published annually by the society and contains the proposed standards advocated by the organization. The tentative standards are published to elicit any criticism before being adopted as standards.

The volume comprises 876 pages and contains 194 tentative standards including 24 on steel, ferroalloys and wrought iron and 17 related to nonferrous metals.

The standards and tentative standards of the American Society for Testing Materials are recognized as authorative in the field of engineering materials. This volume is available at the price of $7.00 in paper and $8.00 in cloth binding. Copies may be obtained by addressing C. L. Warwick, secretary-treasurer, 1315 Spruce street, Philadelphia.

Members of the Tri-City Technical Council, Moline, Ill., inspected the Riverside power plant near Bettendorf, Ia., Tuesday Nov. 3. G. T. Shoemaker, United Light & Power Co., Davenport, Ia., spoke on the operation of the plant.

How and Why in Brass Founding

By Charles Vickers

Bronze Is Pitted

We are making a bronze valve used on the water end of a reciprocating pump, and have trouble due to pitting of the face of the valve. We are using a mixture of copper 90 per cent, tin 7.50 per cent, lead 2 per cent, and zinc 0.5 per cent which gives the strength desired but seems to be chemically attacked.

Phosphor bronze probably would give better results and a good alloy to try is copper 90 per cent, tin 5 per cent, phosphor tin 5 per cent.

Oil Burner Bronze

We want to know the best bronze to use for an oil burner head of peculiar design. The flame spurts directly onto a flat face of the burner heating it to around 1200 degrees Fahr., and this heating superheats the oil on its way to the burner. This heat is controlled by a thermostat and varies. The parts of the burner not in contact with the flame, do not get much heat. A competitor is using an alloy of copper 77.20 per cent; tin 2.63 per cent; lead 4.17 per cent; zinc 14.31 per cent; iron 0.91 per cent; nickel 0.81 per cent, but this alloy develops cracks after short service. This may be a scrap remelt; broken sections show much segregation. A good 88-10-2 alloy appeals to us, but we desire your opinion.

The best alloy to use for this purpose is a nickel alloy like monel metal as such an alloy may be heated to 1000 degrees Fahr., or a little higher without much loss of strength. Next to the nickel alloy comes an aluminum bronze containing 10 per cent aluminum and a little iron, the balance copper. Such an alloy would be inferior to a nickel alloy, but much better than ordinary brass or bronze. The alloy used by the competitor would be inferior to 88-10-2 alloy, as it contains less copper, but at a temperature of 1200 degrees Fahr., both alloys have little strength.

A copper casting made sound by adding 2 per cent of silicon copper would be a good metal to use, but it might be a little too soft. If it was hardened with tin it would be ruined for heat-resisting purposes. The addition of 5 per cent nickel would improve it by making it stiffer and would not injure the property of withstanding heat. Another mixture that has a good reputation for heat work is copper 91 per cent; zinc 9 per cent, and still another is copper 86 2/3 pounds; manganese copper 13 1/3 pounds. The manganese copper should contain 30 per cent manganese. A little phosphorus should be added to improve casting qualities.

To Manufacture Stick Brass and Bushings

We contemplate going into the manufacture of stock stick brass and bushings and would like to obtain information as to the equipment necessary for quantity production.

Methods of molding and casting stick brass and bushings were presented in THE FOUNDRY, Sept. 1, 1922, pages 711 to 714; also in the issue of Dec. 1, 1922 pages 958 to 960.

The articles in question discuss methods of molding and gating for stick brass and bushings, and while they do not touch upon quantity production, or the equipment, it is neccessary first to know the best way of molding and gating such work before rigging for large production.

For bushings ranging from one to six inches outside diameter we believe the horizontal method of molding will prove the most satisfactory, as the patterns with gates may be plated for machine molding. One mistake to be avoided is the use of too fine a grade of molding sand. Use a free venting sand of medium coarseness, if it is the intention to make the flask equipment necessary, cast of aluminum and have thin slits in the sides placed staggered. This will permit the gases to escape freely and keep down the production of porous castings. If the flask equipment is purchased a study of the advertising pages of THE FOUNDRY will solve the problem of suitable flasks, molding machines, and also of furnaces for melting large amounts of metal.

Before making any pattern plates, spend a little time molding and casting the patterns by hand, adjusting and re-adjusting the gating methods, the size and height of the sprues, and make a study of the best pouring temperatures. In short work out all the problems involved in getting maximum output of good castings, to your own satisfaction.

New Sand Needed

We are making bushing castings which develop porosity of a peculiar kind in that the holes are in a regular strata about 1/16 inch below the skin of the casting, and are not found elsewhere, the metal being perfectly sound next the core. The alloys used are 88-10-10 and 90-10 with 2 ounces of 15 per cent phosphor copper added per 100 pounds of alloy. The melt consists of virgin copper and pure Straights tin, and a blanket of charcoal is added as a covering. The metal when ready is poured within three minutes, therefore, it cannot be burnt. When a shaving is removed from the castings they appear alright, but they always come from the sand with a kind of scale. We are sending a sample of the casting, and would like advise as to how we can use the metal in making other castings.

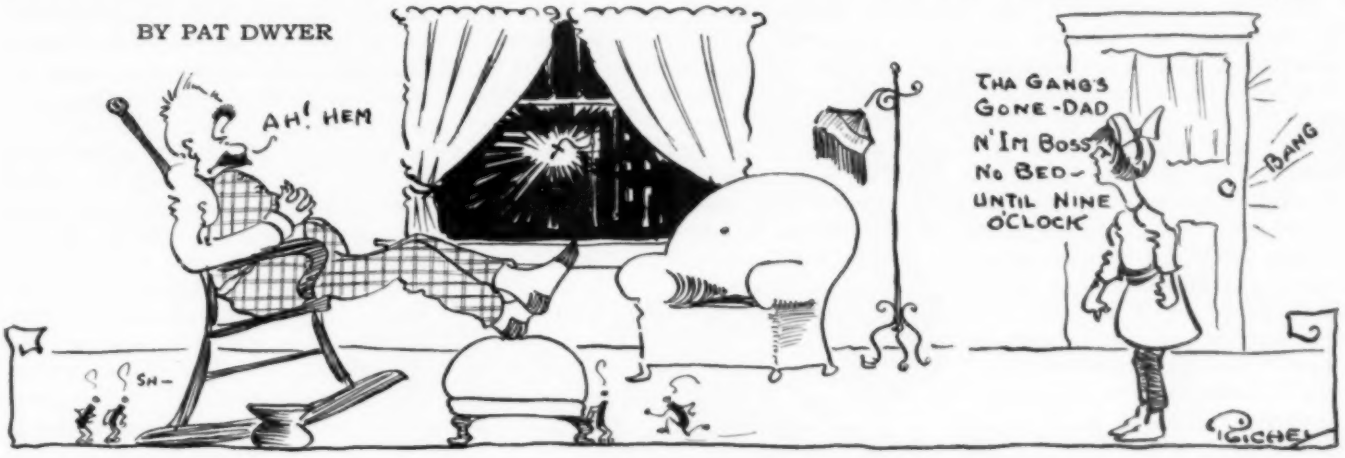
The difficulty is caused by the molding sand. It is *too close* and the remedy is to open it up by adding a considerable percentage of new sand of a coarser grade. Do not get a cheap sand, but one of the well known grades which can be selected from the suggestions that will be found in the advertising pages of THE FOUNDRY. The cause of the holes is bubbling. The metal will not lie quiet against the mold surfaces because the gases produced have to escape through the metal instead of through the depth of the sand filling.

Have at least 1½ inches of sand covering the patterns in the drag, and give the gas a chance to escape between the bottom edge of the drag and the bottom board. Also dust the molds with flour in the old-fashioned brass molder style. It saves lots of trouble in the cleaning room and also forms a carbonaceous insulation between the sand of the mold and the liquid metal, which materially assists the latter to lie quietly in its bed until it solidifies.

As far as the metal is concerned it is alright and may be remelted and used for making the same, or other castings. The gas will escape on remelting, if there is any left in the casting, which is doubtful. If the castings had not been poured cool the gas holes would not have remained near the mold surfaces. Get coarser sand and pour hotter.

Bill Is Reminded of Old Foundry Days

BY PAT DWYER



LAST night after the frugal evening meal had been dispatched, the family scattered after the manner in which the modern family disappears for the few hours intervening between supper—beg pardon, dinner—and bed time. After the excitement had died down and peace once more had spread her wings and all that kind of thing, I found myself alone with a young lady who modestly admits on the slightest provocation that she is six going on seven and therefore properly qualified to turn up her short little nose at a discreet angle when she heard her mother warning me to put her to bed not later than 8 p. m. The dear little cherub waited cannily until the door had closed and then pointed out to me, quite logically I thought, that since the following day without doubt would be Saturday, a day on which she did not have to go to school, this 8 o'clock rule did not hold and she would be quite justified in remaining downstairs until quite late; at least until 8:30 and perhaps even 9 o'clock.

We earnestly debated this nice and delicate point for some time, but either my well meant arguments lacked force or I did not approach the question from the proper angle. In addition to several physical features, she seems to have inherited her mother's happy if at times aggravating gift for calmly ignoring the point at issue and discussing some totally irrelevant subject. For example when I explained diplomatically that all nice little girls paid strict attention to their mothers and crept off to their little nests on the stroke of 8, she wanted to know who made the hours and what made the clock strike eight times at 8 o'clock.

Manifestly I could not step down from my parental pedestal and confess my ignorance on such an elemental point. Besides, I reflected she would discover soon enough that her idol had feet of clay. At the same time I realized that any attempt to explain the subject adequately would be entirely beyond her comprehension. In her little innocent childish way she probably would tell me to cut the bunk, it was over her head.

While I was groping helplessly around in my mind for a few stray bits of information, she relieved my embarrassment by jumping nimbly to another subject. She could give any chamois that ever hopped over the Alpine crags a half mile start and win in a walk.

She gravely informed me that all the children, kids she called them, in her class at school were dumb. In answer to my bewildered inquiry if they made signs with their fingers she loftily replied that they did not, but the teacher had to tell them the same things today she had told them yesterday. "Paw," said she solemnly, "can you beat it?"

TEACHER HAS HER OWN TROUBLES

I tried to take advantage of this strategic opening by pointing out that I knew a certain young person who seemed to forget instructions quite readily, but her mind already was off on another tangent and I had to admit mentally that as an instructor I was in no immediate danger of receiving a medal of merit. The *croix de guerre* now—

Sometimes I wonder whether this same young lady adopts innocence as a pose or if it is just a natural attribute. She can think straight and logically when the occasion suits her convenience. For example at the close of the past school year she told her mother she did not have to return to school for a couple of months. Then she added triumphantly as a happy after thought: "You won't have to wash me any more until the first of September!" I regret to say this little bit of patent hypocrisy earned her a kiss instead of a thoughtful belt from a bed slat.

After about an hour's intensive session I began to look with favor on a bit of cynical advice I had heard one time in regard to the proper method of handling a wife: Catch her young, treat her rough and tell her nothing! However, a daughter is not a wife and besides I reflected bitterly it was too late to begin. Ten chances to one she would totally misinterpret my motive if I bounced a length of gas pipe off her head. If I had commenced at the age of one and afterward consistently kept her in training by the occasional application of a

pick handle, she now would be in a condition where a hard look, a mere elevation of the eyebrow, would send her flying for refuge under the table.

All this while she had been curled up in my lap and the questions, more detached than ever were coming farther and farther apart. Before I finally had made up my mind on a definite and drastic course of action I discovered she was fast asleep and I was faced with a new dilemma. If I held her there, as I felt inclined, until her mother returned I would be blamed for gross neglect of duty. If I carried her upstairs and placed her in bed fully clothed I never would hear the last of it and, as a man who always has delegated the duty to more competent and experienced hands I doubted my ability to remove her garments and array her properly in the sleeping costume. Clearly if ever this was a time for all good men and true to rally to the support of the party.

Nothing was to be gained by procrastination and by taking prompt action I was gratified highly to find, as I had learned on many previous occasions of a diversified character that it is nothing but a sheer waste of time and mental energy to worry over anticipated trouble.

Disciples of the rough house school will claim that I might have waked her by dropping her from a judicious height head first on the floor and afterward jumping a few times on her little chubby fingers. The fact that the idea, excellent in itself, never occurred to me, will be considered as evidence that I am a hopeless amateur and not qualified properly to bring up a child. Maybe so. Maybe so. In justification let me point out that I was handicapped severely. I was holding her too tightly to drop her without a great deal of personal inconvenience and since I was in my stocking feet I doubt if tramping on her fingers would have any great effect.

As the sequel proved I had no trouble. Shift of position and the subsequent journey upstairs awoke her sufficiently to enable her to dispense with my attentions and go through the necessary evolutions under her own power. She was conscious long enough to get inside her night gown, backward as I learned afterward, and climb into bed. By the time I had tucked the covers around her she once more was far away in the famous land of Nod.

At peace with the world and consciously glowing with the satisfied feeling which pervades the righteous at the realization of a job well done, I returned to my roost and prepared myself comfortably for a quiet hour with a pipe and a book. I had not settled down properly when I heard a pair of big feet tramping on the veranda. The sound was so familiar that I was not surprised a moment afterward when the door opened to admit Bill. In my capacity of host

ONE OF THE EARLY MODEL FOUR'S

I intimated politely that people with homes should have sense enough to stay in them on such a night.

"What's wrong with the night?" quoth brave Bill. "Many a night worse than this I have slept on the ground with nothing but an old smoldering railroad tie at my feet to dissipate the cold and dampness. I don't say I would care to do it again, but by no means have I arrived at the stage of senility and utter helplessness where a little bracing air will shrivel me up like the skin on a small boy taking his first dip in the harbor before the ice has disappeared in the spring. Down in that part of the country where I spent my boyhood a spirit of emulation impelled the boys to claim the doubtful honor of the first immersion. How we ever escaped pneumonia always will remain to me the greatest of all the seven wonders of the world. The boys of those days must have been a hardier and tougher breed than those of the present generation.

"Do you remember the leathery old 'bo's who infested the foundries in our early days? Hard old birds who could get drunk every night, pound sand all day and then pour off a floor of molds half a mile long. They remained in a town a day, a week, and in extreme instances perhaps a month, depending to a certain extent on the number and character of the saloons within a reasonable cruising radius and then hopped a freight.

"Usually they were competent mechanics, easy and good natured, willing on the few occasions they had them to share their last cent and last chew of tobacco with others less favored with the goods of this world. Wandering Ishmalites, one and all, they were afflicted with itching feet and could not stay in one place.

"I am afraid the tribe is dying out like the buffalo and the North American Indian. Owing to the gradual change in the method of conducting foundries the field for the old-time, all-around molder is greatly restricted. Boys are not learning the trade in the old-fashioned way and there is not the necessity, the opportunity nor the incentive for a molder to learn every branch of the trade, or even to learn one branch thoroughly. Mechanical appliances, scientific research and the application of modern manufacturing methods have eliminated the hazards and removed so many mysteries of the trade that a man no longer is in a position to take a proper degree of pride in his individual skill and knowledge.

"Perhaps the universal and inexorable law of economics is the principal factor responsible for present conditions. A man here and there may be found who works for pleasure. I never saw one, at least in the foundry, but I have heard and read occasionally of one of these rare cuckoos and for the sake of the argument let us admit that a few of these misguided creatures exist.

"If you follow one of these rumors to its source you will find that the man who claims he is working for pleasure has an independent income and does not need to care whether he works or not. He is his own boss and while it is true that he may work just as hard as another, still he is free from the everlasting shadow of the Damocle's sword that hangs over the man whose job depends on the personal whim of the man who employs him. The great majority of men work for the pecuniary remuneration involved. Contrary to a somewhat popular belief the average man is blessed with a fair degree of intelligence. Oh! all right. Call it a species of low cunning if you will. The fact remains that he wants a job that will pay the most for the least effort. He wants enough of the old mazuma, the kale, the long green, the collateral,

to buy food, clothing and shelter with an occasional ticket to a movie and a pint of gas now and again for the old flivver.

"The molder tells his son he is a fool to spend four years at small wages learning a trade that eventually will pay him $7 a day, when untrained men are taken into neighboring foundries and given a course of intensive training for a few months on one job that enables them to earn more money, and there y'are!

"I have no remedy to offer for this condition, but there is no use dodging the fact that such a condition exists and thoughtful foundrymen are pondering where the supply of future foremen and superintendents are to be recruited and trained. It is one thing to train an operator to run a machine or to perform a single operation in the cycle of motions that go to the production of a casting, but the man in charge must have a knowledge of all these operations and a grasp on the fundamentals of the industry that remain the same whether the molds are made under the new or the old system."

"Bill," I said, "you are wasting your time—and mine—telling me a story with which I am familiar. I learned many years ago to mind my own business and since in all probability I never will own a foundry and therefore never will be confronted with the problem of securing adequate help I ask you as man to man why should I worry over the problematical future of the foundry industry?"

"The point raised by my honorable friend from Red Dog," said Bill in his most impressive presiding-officer manner, "is well taken. Probably he now will propose to give the good old college yell 'Red Dog—Red Dog—Hot Dog—Diggity Dog—Bow-Wow-Wow!' and move that the meeting adjourn for a definite period.

"I like to hear you talking about wasting time. If you had a penny for every hour you wasted you could not find a barrel in the town big enough to hold them. I have wasted a few myself, but I am not losing any sleep worrying over them.

"At the recent convention I met a man from Waterbury, Conn., and I was reminded of an experience I had in that town many years ago when I was a young *gay cat*, blithely hopping from town to town after the manner of the free and independent molders of those days. As the jolly old poet has it, 'Them was the days, kid, them was the days.' When all the world is young lad and all the trees are green and every goose a swan lad and every lass a queen. Then Hey! for boot and horse lad and round the world away; young blood must have its course lad and every dog his day."

"That boot and horse stuff," I said, "is hopelessly out of date. The young blood of today wants to view the world from a limousine."

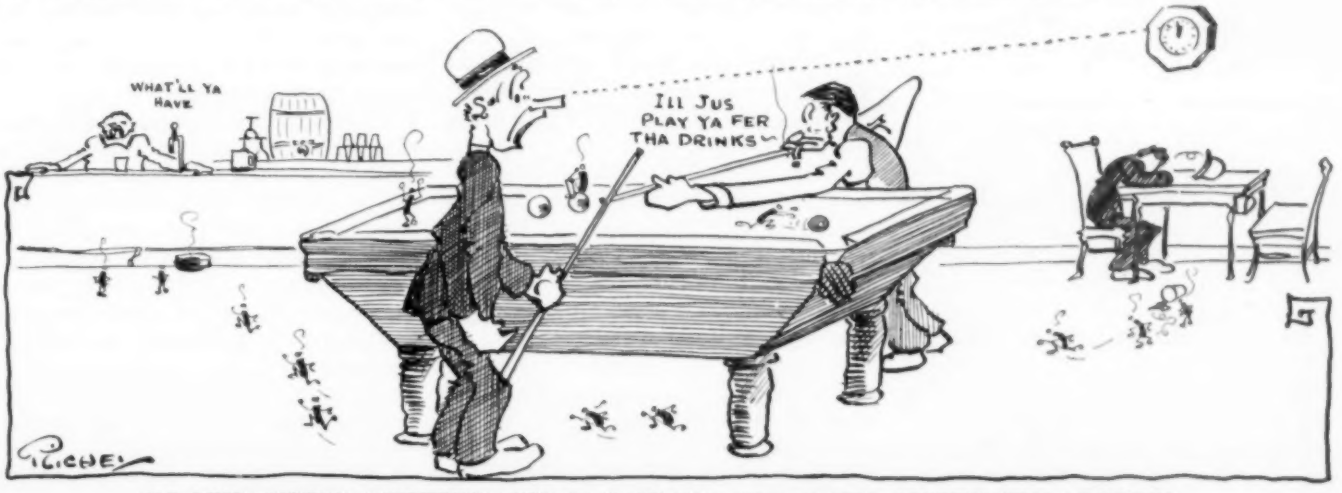
"Horses still held the center of the stage," said Bill, "at the period to which I refer. I blew into town one day and caught a job in one of the foundries, on the dry sand floor. Old timers will recognize the shop when I say that the president of the company resembled Jiggs, top hat and all. He died a few years ago from old age. He was an old man in my time and usually tottered around the shop for about an hour every day talking to any of the men that took his fancy.

"However, I started to tell you of an experience I had illustrating the conditions that prevailed. One afternoon about 3 o'clock my partner proposed in all seriousness that we slip across the track to McCarthy's saloon for a drink. I was properly horrified at such a base suggestion, but the insidious voice of the tempter overcame my scruples.

"As I said I was young at the time and timid and did not relish the idea of having a can tied to me in the event of discovery. The idea of being accused of wearing a white feather was still less to my liking and though what little conscience I had kept whispering that I was a fool for jeopardizing a job for a silly sentiment, still I was weak enough to take a chance.

"Innocently I expected to dash in to the bar, snatch a drink, and fly back to work. My companion had more exalted ideas of the proprieties to be observed while consorting with gentlemen of leisure. Before ordering the drink he engaged in animated conversation with several of the bar flies and then with one foot on the rail he leisurely absorbed the contents of the foaming beaker. Etiquette demanded that I should return his courtesy by pledging him in a second round. Naturally I supposed that would conclude the ceremony and you can imagine my consternation when this hardened old reprobate suggested that we would play a game of pool to decide who should pay the score.

"By this time I decided philosophically that I was as good as fired and there was no merit to be gained by interrupting the day's sport. The lad was a good molder but he was an even better pool player and I was stuck for the full amount of the bill. I suppose I should wind up by stating that we were met at the door by the gaffer who cheerfully handed us our time, but a strict regard for the truth compels me to say that we arrived back in the shop safely and in plenty of time to knock off decoriously with the remainder of the gang when the whistle blew. If there is a moral in that," said Bill as he arose to go, "put it in your pipe and smoke it."



OLD TIME WORKING CONDITIONS SEEM TO HAVE HAD ONE OR TWO COMPENSATING FEATURES

Constructing a Screw Blade Casting

By J. G. Fitzpatrick

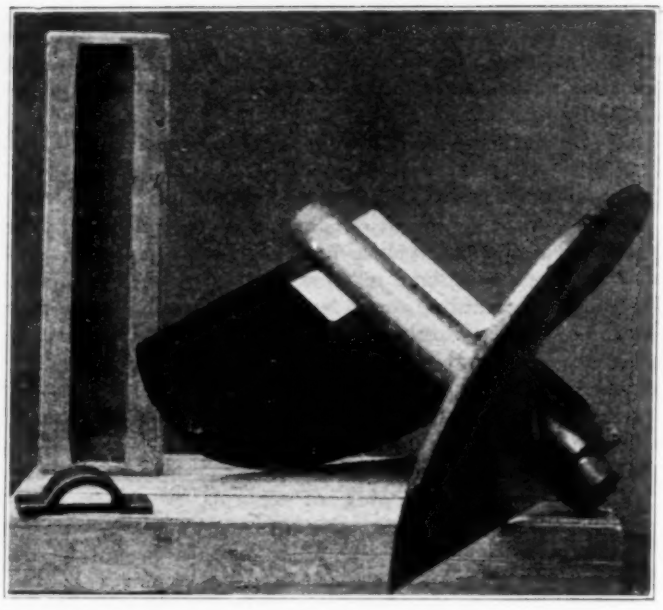


Fig. 1—The pattern was molded on end in a two-part flask

SOME time ago I had an order for an unusual type of casting to be used as part equipment for a coal washing machine. The casting was to be 18 inches long, equal to the helix or one turn of a screw blade, 24 inches in diameter, 18-inch pitch with a blade thickness of ½-inch. The casting was to be bolted to a cold rolled steel shaft by two half hubs, one at each end at opposite sides of the shaft and with loose caps to match. The finished pattern is shown in Fig. 1.

The core print, a shaft of wood 22 inches long, 2⅞ inches diameter extends about 2 inches over each end of the pattern proper. The half core box corresponding to the core print is shown standing on end together with loose cap patterns. By bolting several castings end to end on the shaft, a continuous screw blade could be constructed, its root touching the shaft and its length depending on the number of castings attached.

What puzzles many patternmakers in attempting to lay out a screw is the continual changing of the angle of the blade from root to tip. The problem really is quite simple. A screw is nothing more or less than a helix, that is a straight line described at any given angle around a cylinder. The angle of the blade at any point on its surface is the same as the hypothenuse of a right angled triangle whose base is equal to the circumference of the blade at this point and the height is equal to the pitch of the screw.

Method of Construction

Three points are to be taken into consideration: First, the diameter of the screw at the root, where it joins the hub; second, the diameter of the screw at the tip or outside diameter; third, the pitch of the screw. In *C* and *D* Fig. 2, triangles are laid out in accordance with the dimensions taken from these points. Multiplying the diameters by the constant 3.1416 gives the circumferences. These are used for one side of the triangle and the pitch of the screw is used for the other. The hypothenuse gives the angles of the blade at these points. Having obtained the angles the next step is to make a working layout for the section or segment of the blade.

The number of segments govern the size and thickness of the wood used. The direction of the grain of the wood must be considered owing to the extreme width of the blade. In the triangle *D* Fig. 2 the hypothenuse is 77.517 inches long. This divided into 26 spaces gives a chord dimension of 3 inches. Therefore, for convenience 26 segments will be used in the make-up of the blade. A horizontal line 6 inches long is drawn and marked *X Y*, as in *A*, Fig. 2 with a vertical line drawn through its center. Another line is drawn at the intersection with a bevel set to the angle of the hypothenuse of triangle *C*. At a distance of ¼-inch on each side of this line and parallel to it another line is drawn, making three in all. This will be the angle and thickness of the blade at the root.

The bevel then is set again to the angle of the hypothenuse *D* and a line is drawn through the same intersection, but in the opposite direction. Other lines are drawn on each side of the center line as in the preceding instance. This will be the angle and thickness of the blade at the tip. Since 3 inches is the chord measurement of the segment, the dividers are set to half this dimension and the segment is marked off at this angle and on each side of the intersection. This will give the size of the segment at the tip or outer diameter.

To obtain the length of the segment, all that is necessary is to prolong the vertical line. With the dividers set to 12 inches an arc is described to cut this line. From the same center and with the dividers set to 1 7/16 inches another arc is described to cut the same line. The chord of segment is projected on to the 12-inch arc. Radical lines drawn from the center point, pass through these projected points and give the size and shape of the segment in the rough, *A* and *B*. The chord measurements at the root of the segment are projected from *A* on to *B* by setting the dividers to the distance shown on the 1 7/16-inch arc where radiating lines cross.

Building the Pattern

A core print was turned 2⅞ inches diameter, 22 inches long and tapered on each end for a distance of 2 inches to a diameter of 2 inches. A piece of paper was cut to a rectangle 9 x 18 inches as shown at *E* representing the pitch and development of the circumference of the screw at the root. The thickness of the blade at the root was indicated by the two lines drawn diagonally across the paper and ¼-inch on each side of a center line. The paper with the lines on the outside was glued carefully around the core print. The ends met and were matched carefully and then the job was set aside to dry.

Outline of the segment was marked on a thin templet and the necessary number of segments were cut to the required shape. By referring to *A* it was found that by constructing a rectangle with sides parallel to *X Y* and with length and width governed by the extreme points of the segment, the thickness of the wood to make the segments was 1¼ inches. A board was planed to this thickness and the outline of the 26 segments was marked from the templet following the grain of the wood. They were cut on the

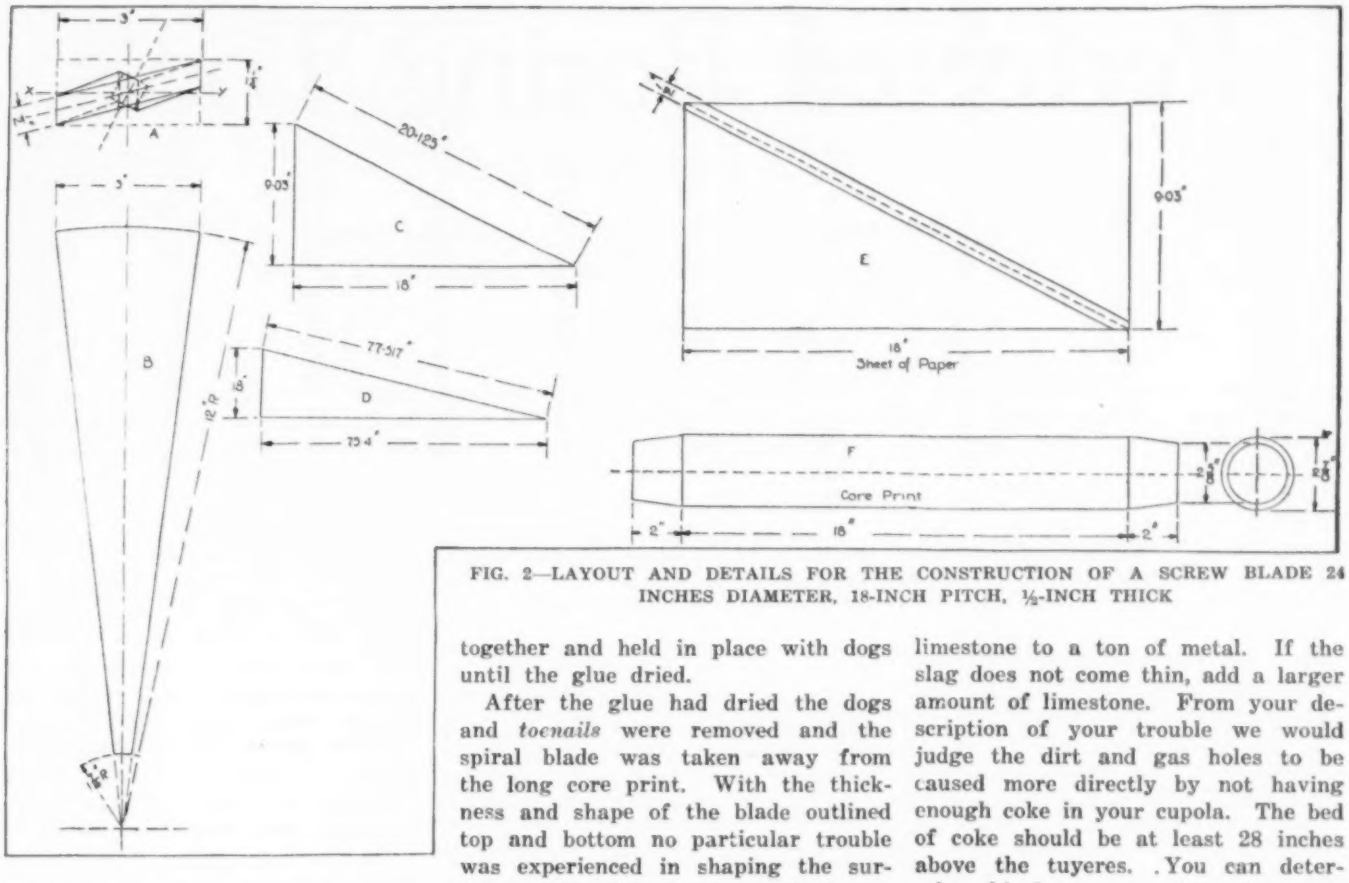


FIG. 2—LAYOUT AND DETAILS FOR THE CONSTRUCTION OF A SCREW BLADE 24 INCHES DIAMETER, 18-INCH PITCH, ½-INCH THICK

band saw and then trimmed accurately to the line. The shape and angle of each segment were transferred from the layout by setting each segment on end in place. This part of the operation depends for its accuracy on having the pieces parallel. After the segments were marked they were chamfered on the small end down to the line representing the thickness of the blade at the root. The advantage of this preliminary chamfering was obvious when the time came to nail the ends to the long core print.

Two *V* blocks were formed on the saw and fastened to the top of two horses set at a suitable distance apart on the floor. The blocks held the print while attaching the segments and prevented it from rolling except when required as the building of the job progressed. After the glue on the paper had dried the ends of the segments were *toenailed* to the shaft. The path of the blade was marked on the paper and served as a guide in locating the ends of the segments as they followed each other.

The first segment was set to the joint in the paper and was temporarily *toenailed* in place. The others were *toenailed* similarly in turn following the line on the paper until the last segment fitted into place on the joint of the paper at the opposite end. The joints of the segments were glued together and held in place with dogs until the glue dried.

After the glue had dried the dogs and *toenails* were removed and the spiral blade was taken away from the long core print. With the thickness and shape of the blade outlined top and bottom no particular trouble was experienced in shaping the surface of the blade to the desired contour. Most of the work was done with a flat crank gouge working from tip to root. The finished blade was slipped back on the center shaft and then the shells for the two half hubs were attached to each end and nicely filleted at the junction. The pattern was designed to be molded on end and for that reason the bolt lug was made the full length of the pattern on one side as may be noted in Fig. 1. The unnecessary parts were stopped off in the mold after the pattern was removed.

The mold was made in a two-part flask with the joint line in the sand following the upper edge of the blade. The exceedingly deep lift over a great part of the blade was carried by long gaggers and chuck bars attached to the cope. The metal was poured into the mold through a thin wide gate cut into the upper edge of the blade. Twenty castings were made from the pattern and assembled on the shaft.

Preventing Gas Holes

Question—We have a cupola lined to 32 inches in diameter and melt about 4 or 5 tons of iron per heat. The iron comes dirty and full of gas holes. Would the addition of limestone help this—if so, how much should be added?

Answer—Your melting would be benefited by the use of 50 pounds of limestone to a ton of metal. If the slag does not come thin, add a larger amount of limestone. From your description of your trouble we would judge the dirt and gas holes to be caused more directly by not having enough coke in your cupola. The bed of coke should be at least 28 inches above the tuyeres. You can determine this by a measuring stick from the charging doors. The first iron should come out hot and have plenty of life and should show at the top hole in 8 to 10 minutes after the blast has been put on.

Offer Building Book

Handsomely printed in two colors, an attractive book entitled, "The Austin Book of Buildings" has been issued by the Austin Co., Cleveland. This publication, while essentially a piece of sales literature, goes far in presenting an outline of modern building construction in a number of different industries. The portion devoted to the foundry industry illustrates stove shops, steel plants, gray iron and nonferrous establishments and contains illustrations of ideal arrangement of such foundries.

A section of the book is devoted to a discussion of standardized types of construction that have been applied to a wide range of industrial requirements. Emphasis is directed upon the celerity with which such type buildings can be made ready for use after the contract is awarded. The back portion of the book contains information and drawings showing the details of walls, floors, doors and roof structures. Facts on insurance rates governing different kinds of buildings, and a list of clients close the publication.

Perfected Boring Tools

Aid Patternmaker

Greater Accuracy Secured Through the Development of Various Types of Bits—Care Must Be Exercised in Filing

By Walter C. Ewalt

AWLS, gimlet bits, twist drills, auger bits, expansion bits, forstner bits, countersink and plug cutters are the kinds of tools used by the wood patternmaker in making round holes in wood. Aside from the awl, these tools cut into the wood in a circular shape, the inner cylindrical portion of the wood being gradually removed. Bit is a common name applied to some of these tools, so called, it may be assumed from the biting action at the end of the tool or it may be said a bit is a tool that bites. A bit usually is attached to a brace, which will be explained later, and rotated. The rotating action is assisted by a screw or worm at the end of the bit which causes the bit to work into the wood.

It is not difficult to comprehend that the origin of the first boring tool probably was the awl. This may be assumed since this tool is the easiest to obtain. Perhaps a piece of hard wood or sharp flint was used to pierce the skins, the wood utensils or even the stone jewels used and worn by aboriginal mankind.

Awls are shown in Egyptian tombs of 1706 and 1490 B. C. Pliny states that Daedabus invented the gimlet 1240 B. C. It was destitute of a screw point but may have had a hollow pod and a cross head to form a handle. Neil M. Judd in the *National Geographic Magazine* in speaking of a turquoise necklace found in the ruins of Pueblo Boito says.

What reader, for example, fails to understand and appreciate that marvelous turquoise necklace recovered by the expedition of 1924. The lapidarian skill of its maker, the joy and pride its original owner must have felt in sheer possession of it are perfectly obvious, but the reader scarcely can know that an unbelievable amount of labor went into the fabrication of this prehistoric jewel; that the rough unworked stone was obtained only at the cost of great human effort, that the 2500 beads composing the string, were made individually by rubbing small disks of matrix back and forth across sand stone tablets, that each tiny piece was drilled separately with a sharpened flint or some still more pointed instrument.

It is to be hoped that the drill used by this ancient lapidary may be found in the ruins. This indeed would add to the "inestimable contribution that society has made to science" by the discovery of the necklace. Associated with all of these common tools which we use is the story of some of the most beautiful things in life. The artist must employ the tools of the artisan in discerning and transcribing the beautiful or aesthetical in nature The artist must employ them in painting, the sculptor in carving the stone. Who can say which enjoyed the masterpiece more, Stradivarius the maker of the violin or Kreisler the musician?

A great sense of pride develops in making a fine looking pattern and corebox, especially if slightly complicated like a globe valve. At this time when men of affairs are advocating apprentice schools to teach the trades, when every effort is being made to supply men to take the place of the old time, all around artisan, some method must be employed to stimulate the ambitious young men. They should be taught that the trade is honorable. They should visualize the ultimate use of the product of their labor, for example the use of the globe valve mentioned above. They should picture how it harnesses the power, or is a link of a hundred miles of pipe, over the hills, in the valleys, through deserts or fertile countries. If the apprentice could be impressed with the idea that his job is perhaps the beginning of a wonderful project, that his work is making some one happy, that through him every one is having a better time in life, perhaps the making of apprentices would not be such a difficult job

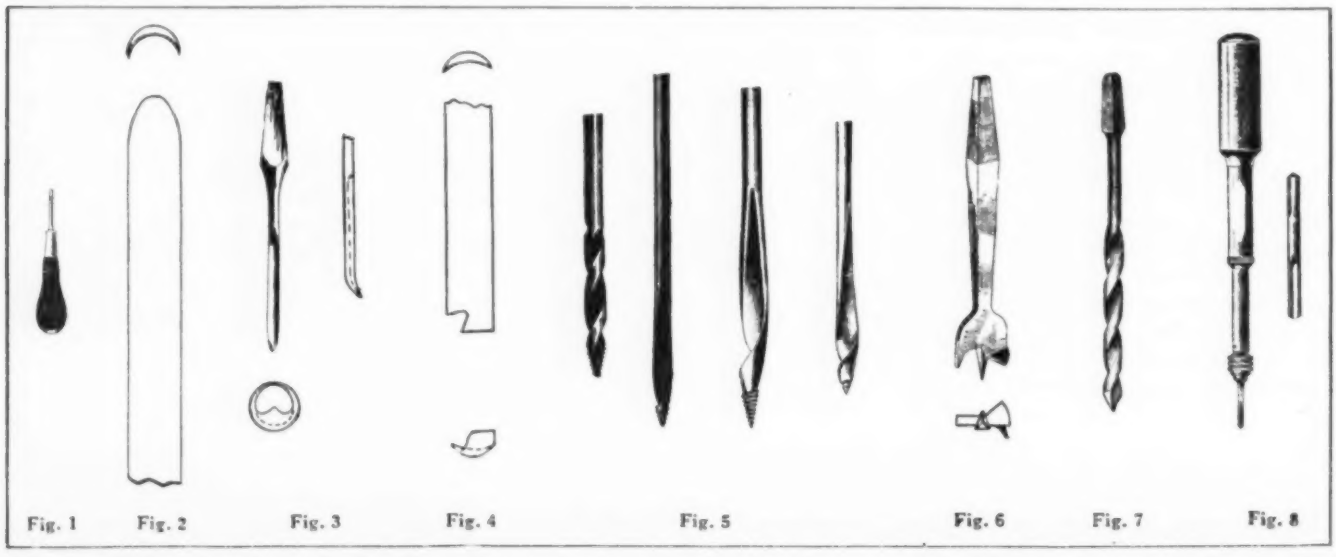


FIG. 1—A BRAD AWL. FIG. 2—THE EARLY GOUGE BIT. FIG. 3—THE SPOON BIT. FIG. 4—A NOSE BIT. FIG. 5—GIMLET BITS. FIG. 6—A CENTER BIT. FIG. 7—THE TWIST DRILL. FIG. 8—AUTOMATIC DRILLS

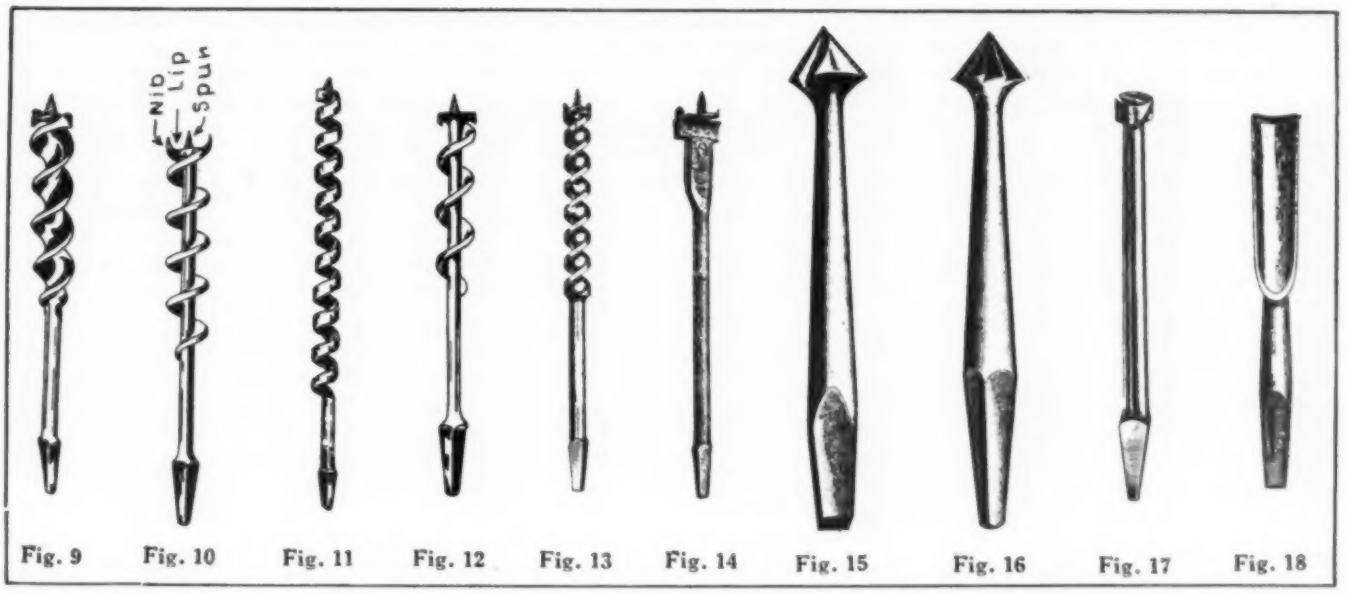


FIG. 9—COMMON BIT. FIG. 10—WITH SOLID CENTER. FIG. 11.—TWISTED BIT. FIG. 12—TWISTED BIT WITH SOLID CENTER. FIG. 13—TYPE OF BIT USED EXTENSIVELY. FIG. 14—EXPANSIVE BIT. FIG. 15—SNAIL COUNTERSINK. FIG. 16—ROSE COUNTERSINK. FIG. 17—FORSTNER AUGER BIT. FIG. 18—A PLUG CUTTER

after all. These young men should think of their work with dignity, that their work is of the utmost importance, which it really is. They should see that what they produce is something more than wood and glue, sand and iron, machines and steel. An attempt should be made to have them grasp the fact that there is a spirit in what they do, which is as much a living thing as anything made by human hands.

An important discovery in the construction of the bit was made in time, and the sharp point at the end of the gimlet was made into a screw. This made the work of boring much easier, for instead of the operator pushing the bit, the screw pulled it into the wood. Only a comparatively short time ago the spiral twisted bit was added which draws the shaving toward the shank, making it self discharging.

The oldest boring tool namely the awl shown in Fig. 1, still is used for making holes in wood to spot brads and nails. Since the end is shaped like a wedge, the edge is pushed into the wood across the grain. If pushed with the grain, the wood may split.

We will have to examine the tools of an older pattern maker to encounter some of the bits about to be described, although occasionally some are found that have been handed down. A number of these tools had some advantages over the modern kind, for example in ease of sharpening, longer life, cheapness, and ability to bore thin wood without splitting it. One of the earliest bits is called a gouge bit, shown in Fig. 2, so called because it is shaped like a gouge. This bit also is known as a shell bit or quill bit. It is rather difficult to start this bit in the right position without first cutting a groove at the perimeter of the hole, since the bit has no fixed center. It cuts the fibers of the wood at the circumferance of the hole and the wood is removed in the center as a solid core, depending on the depth of the cut.

The spoon bit shown in Fig. 3 was popular. This bit has the point tapered and bent to the center of the radius of the semicircle. This conoidal end enabled it to be placed more accurately at a given spot, this being of considerable advantage.

Fig. 4 shows a nose bit. This is the first example of a routing cutter, similar to our present day auger bits. This tool also is called a slit nose, due to the slit a short distance from the center. The larger part of the split end is bent inward at nearly right angles to the shaft. The edge is sharpened like a chisel and cuts the wood at the bottom of the hole. Some means also must be employed in starting this bit in the right position, as in the gouge bit.

At Fig. 5 are shown four examples of gimlet bits. The cutting is done on the side, that is at the corner between the worm and the shell. Although these cuts show that all the gimlet bits have a threaded end, there are some which terminate into a twisted point. At one time, probably before the introduction of the twisted shank type shown in Fig. 5, the bit was fluted, shaped like the spoon bit and it had a sharp worm beginning as a point and extending to the full diameter of the tool. The gimlet bit is used for boring small holes for nails and screws and as the shell part is short, it is filled rapidly with the shavings, consequently the bit must be withdrawn from the hole often to have the shavings discharged.

The center bit, is shown in Fig. 6. This is an excellent tool when boring thin wood. The point is triangular shaped and will not split the wood as easily as the worm bits. The bit is made in sizes ranging from ½ to 2½ inches. The nicker or scorer, which also is called a nib is located at one side. This first cuts the fibers of the wood. On the other side is a broad chisel like edge, of slightly less radius than the scorer which is set on an angle and called the lip. This pares out the wood within the circle first cut by the scorer, as it is a trifle longer than the lip. This type has several disadvantages. It does not work in end grain and the hole, as a rule, is not perfect since there is not sufficient surface on the sides to guide it. The bit is spoiled easily by striking a nail.

Various forms of the center bit were made to work in soft and hard wood. Among them was an expanding form which was a forerunner of the modern expansion bit. All of the bits mentioned above were obtained in many sizes and a number of different forms not mentioned. They were exceedingly valuable tools in their time.

The twist drill does not split the wood easily and it cuts rapidly. This type of drill is sharpened easily on a grindstone and will last until almost all of the twist is ground away. A clearance must be left back of the cutting edge in grinding. It

will be noticed the cutting edge is on the bottom of the twist drill and on the spoon and gimlet it is on the side. This set is made in sizes ⅛ to ⅜. For holes smaller than ⅛, it is well to have an automatic drill. Only the drills and not the handle will be mentioned now. These bits take the place of the old brad awl. They are of two styles, the flat drill, not shown, and the double fluted at *B* Fig. 8 and they range from 1/16 to 11/64 inch.

Figs. 9, 10, 11, 12 and 13 show the twisted auger bits commonly used, although Fig. 10 and Fig. 13 show the type usually used by patternmakers. There are four different modes or styles of twist bits. In Figs. 9 and 13 the spiral is formed by twisting a parallel bar while the threaded spur and also two ribs and two lips are at the end. These are called double twist bits.

Figs. 10 and 12 show the single twist bits. This is known in England as the American bit. The spiral rib in this case winds around a center shaft and the end terminates in a worm. In some cases there is only one nib and one lip and in other cases two. The position of the nibs may be reversed as shown in Fig. 10 and Fig. 12. For patternmakers the type shown in Fig. 10 is preferable. The spiral may be formed by being brazed on the shaft, or the bit may be swaged between dies. It also is twisted from a central stem having a single straight rib.

Fig. 11 is a half round bar twisted into a spiral ribbon, the flat side being on the outside while the inside is a hollow spiral. The worm or spur is at the bottom. This type has a nib formed by the outside of the bit and also has a lip. The corner where the nib and lip meet, must be kept sharp. A spirally grooved cylinder bit also is used similar to that shown first in Fig. 5.

The greatest distinction between the old and new styles of bits is the spiral form which allows the shavings to ascend from the bottom of the hole. This saves the trouble of frequently taking the bit out of the hole to clean the shavings. Several other advantages for the newer type of bit, such as boring true round holes to size and making a long straight hole.

An expansive bit is shown in Fig. 14. This style of bit is useful since various sizes of holes may be bored by adjusting the cutter. These bits are made in a small and a large size while some makes have the shank graduated in eighths for determining the depth of the bore. The cutters are made in several sizes and are interchangeable and also graduated. The larger size is more desirable from the standpoint of the patternmaker as the holes less than ⅞ inch may be bored with auger bits. These bits are constructed with a threaded spur at the end. As the spur advances the wood comes in contact with a nib and lip which is stationary on the shank. Just above the nib and lip is the adjustable cutter which also has a nib. The cutter is held in place by a clamp which is held down by a screw.

Two styles of counter sinks are shown in Fig. 15 and 16. The one shown in Fig. 15 is known as a snail countersink and that in Fig. 16, is known as the rose. These tools are used to bevel the edges of a hole to fit the underside of the head of a screw thus allowing the head to remain flush at the surface. This type of bit come in two sizes, ½ and ⅝ inch, being the diameter at the largest part of the bevel.

The forstner bit shown in Fig. 17 is guided by its circular rim instead of spurs which are on the other bits. The nibs, instead of being a small part of the circumference are carried almost entirely around, consequently it bores any arc of a circle and may be guided in any direction, with or against the grain. It bores slowly and does not spit the wood easily because the shape of the nibs forces the wood towards the center and this is cut off by the two cutting lips. It leaves a flat bottom hole which is convenient in many cases. Holes overlapping one another may be bored with this type of bit. This is an exceedingly fine tool, but hard to sharpen and easily spoiled by careless usage.

The plug cutter shown in Fig. 18, is used to cut out plugs of wood. These are glued in screw holes that have been countersunk fairly deep and hide the head of the screw. The cutting edge is shaped like an inside gouge and by forcing the cutter into the wood a plug approximately ⅝ inch long may be made. Three sizes namely ⅜, ½ and ⅝ inch should be had. Plugs may be made by sawing a board ⅜ inch thick and placing it next to another board in the vise. If the cutter is working properly, satisfactory plugs may be made.

To prevent splitting the wood at the opposite side of the hole, when using bits with worms, just as soon as the worm shows on the opposite side the bit should be withdrawn and the wood bored from the other side. Splitting also may be prevented by clamping a board on the opposite side. A beginner may have some difficulty in boring a straight hole. In that case a try square will assist in boring perpendicularly to the surface. After some practice it can be sighted by lining it up with some thing known to be perpendicular, such as a window etc., and finally that sense of things square with one another will be obtained and it will be unnecessary to resort to the above tests.

A bit file is used to file the nibs and cutter. Under no consideration should the outside circumference or the under side of the lip auger bits be filed as the necessary clearance will be destroyed.

Advocates More Care in Drying Molds

Baking or skin drying of large molds must be conducted carefully that the mold may be thoroughly dried, but still retain its strength. The bond of some sands and loams is destroyed at a temperature above 400 degrees Cent., while other loams will stand temperatures as high as 700 degrees without any appreciable change in the bonding strength.

In a recent address before the Pittsburgh Foundrymen's association, Jesse L. Jones, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., called attention to these points. Mr. Jones said:

It is evident that foundries using sands, the bond of which suffers from exposure to high temperatures, should be careful in baking or skin drying not to exceed the critical heat at which strength disappears. In many foundries coke fires are built in the mold itself, the burning coke being in direct contact with the surface of the mold. Even when the coke is suspended above the mold in an iron basket or when a torch is used for drying, it is a question whether temperatures are not reached that are detrimental to the mold. During the recent European trip of the American Foundrymen's association, it was noted that the baking of molds in most of the larger foundries was conducted with greater care than seems to be used in the United States. Many foundries dried their molds by passing heated air into them. This heated air was generated by blowing air at room temperature over incandescent coke, with the aid of a blower. One Belgian firm had an extensive array of driers of this type. They had pipes leading from the heating chamber of the furnace to the mold so that the heated air could be introduced at a number of points. The molds were covered in the usual way with iron sheets to prevent the too rapid escape of the heat. By use of mold heaters of this type it is reasonable to suppose that temperatures that would injure the molds and weaken their

surfaces would not be obtained, yet the drying would be done rapidly on account of the large volume of heated air that is introduced.

The writer recently had the opportunity to examine a large mold made from Millville gravel and baked with a direct coke fire. While the skin of the mold was fairly strong, just under the skin the sand had lost its bond to such an extent that if poked by the finger, it would rattle out like quicksand.

Where a molding sand has to be used in which the bond rapidly is destroyed by long exposure to high temperatures, the molds should be shaken out as soon as the castings reach a dull red. Cast iron being as strong at 556 degrees cent. as it is at room temperature, there should be no more danger of the castings cracking from rough handling than if they were allowed to get cold before shaking out. The castings would not be made any harder by this treatment although internal stresses might be set up in them if they were cooled unequally or were of unequal cross section. This should give the sand a longer life and reduce the amount of new sand that must be added to the heaps.

Any foundry using a sand like the Millville gravel and drying its molds should devise a mold drier that will dry at a moderate temperature or consider obtaining such a drier from a manufacturer of foundry supplies.

Readers Comment

Note—Material appearing under this head does not necessarily reflect the opinion of The Foundry or of its editors.

Disagrees on French Malleable Practice

GENTLEMEN:

Recently we read your issue of Feb. 1 which had been mislaid, and were greatly astonished to read in an article by William Ruddy, *French and American Iron Foundry Methods Compared*, certain inaccuracies that we feel obliged to correct them.

Mr. Ruddy says that:

"The only blackheart malleable iron made in France is turned out principally by two American firms who are using their entire output in their machines and specialties. The French make malleable iron castings by the cupola process but the castings are far below those turned out by the American cupola malleable iron manufacturers."

"Air furnace malleable iron is unknown or if some of it is exploited the product obtained is not comparable to American made furnace malleable."

However, we have received visits from several American engineers at the Citroen foundry—perhaps even Mr. Ruddy himself—and they have seen in the regular production, a 15-ton reverberatory furnace producing exactly the same quality of metal as in the United States.

For the purpose of being able to compare our metal with American metal we have adopted the same type of tests and you will find enclosed a copy of two certificates; one made on Jan. 28, 1925 and the other one on May 11, 1925, the first by *Le Conservatoire National des Arts et Metiers de France;* and the second by Enrique Touceda, C. E., Albany, N. Y.

However, we acknowledge that it is due to the kindness of all the foundrymen whom we have visited in our stay of some six months in the United States that we have been able to obtain these results and we are pleased to take advantage of this occasion to thank them now.

Tested by Enrique Touceda

No. of bar	Ultimate strength lbs. per sq. in.	Elongation Per cent in 2 in.
203 B	55,520	15.0
203 B	55,100	14.5
204 B	53,030	19.5
204 B	52,120	18.0
205	54,265	17.5
205	50,965	10.0
206	51,242	11.0
206	51,100	21.5

Tested by Conservatoire des Arts et Metiers

No. of bar	Breaking load lbs. per Sq. in.	Per cent elongation
149	58,480	20.4
149 B	55,780	22.8
150	55,780	20.0
151	54,650	17.5

We do not doubt that Mr. Ruddy is unaware of his error and we hold ourselves at his disposal to furnish him with all the information which he may desire.

We wish to point out also that as a result of the abnormal rate of exchange it is at present difficult to buy supplies and equipment in the United States. However, we have done this, for example we have purchased registering pyrometers from America although we could have purchased such equipment in Germany—equipment possibly a little less precise, but certainly at a greatly lower price.

Very truly yours,
ESTABLISSEMENTS GAILLY FRERES,
G. GAILLY,
Charlesville (Ardennes) France

Claims New Sand Is Not a Necessary Factor

In an answer to an inquiry which appeared on page 840, Oct. 15 issue of THE FOUNDRY the concluding lines seem to indicate that the only commercial method for renewing molding sand is to add new sand. Evidently you are not aware that a better and cheaper sand may be prepared by the addition of a clay binder. It is true that attempts failed in the past to rejuvenate sand in this manner, but that was due to the poor quality of the clay and the lack of intelligent application.

Using sand testing methods developed by the American Foundrymen's association, many foundries successfully and continuously are rejuvenating old sand by the direct and simple application of a clay bond. To any person interested I will supply the names of a number of foundries where no new sand has been used for this purpose for periods ranging from 6 months to 2 years.

The two following paragraphs are taken from the report submitted to the Syracuse, N. Y., convention by the chairman of the sub-committee on sand conservation and reclamation:

It has not been, however, until within the last year or two that any general progress has been made on a practical shop basis, especially where only 1 or 2 per cent additions of the binding material (clay) have been employed and where operation has continued for several months or a year with no unusual difficulties.

Favorable reports coming to the writer's attention indicate that over a period of time varying from 3 months to a year, practically no new sand has been employed in many instances, while in others a marked reduction in new sand invariably has taken place.

From my own experience I may claim that the substitution of clay for new sand is accompanied by a reduction in cost up to 80 per cent. Unless it is contradicted there is a possibility that your "Question and Answer" may have the effect of restraining many foundrymen from using methods by which important savings may be effected. Knowing that you are in the van of every progressive foundry movement I submit the foregoing in confident anticipation that you will publish it in your columns.

THOMAS C. FLINN,
East Cambridge, Mass.

Clemeny Voroshiloff, recently made chief of the Russian Red army, was born a peasant and spent his early years as a foundry laborer.

Sixty Year's Should Be Ample Preliminary Training for Car Wheel Production

STATISTICIANS accustomed to placing objects end to end or piling them to unbelievable heights will find a problem worthy of attention in any attempt to show the number of car wheels made during the past 60 years by Robert C. Tolmie, general manager of the Lobdell Car Wheel Co., Wilmington, Del. Perhaps no useful purpose would be served by a computation of that character. Even if the calculation showed that the number was sufficient to provide every man, woman and child in the state of Delaware with an individual wheel, that item in itself would not add materially to the sum total of human knowledge. In the first place it is doubtful if every man, woman and child would appreciate the ownership of a car wheel and in the second place the total number no longer is in existence.

Car wheels only enjoy an ephemeral existence of a few years and then they go back into the cupola to be converted into new wheels. Believers in transmigration may claim that the spirit of the original wheel appears in every successive reincarnation, but that theory leads too far afield and imposes too severe a strain on the faith of the ordinary person. Scoffers will claim that it takes a mighty robust spirit to survive a dozen passages through a cupola. Statistics are wonderful things if you don't peer into them too closely.

'Twas Eighty Years Last August

An adventurous stork wearily winging his way over the wilds of Pennsylvania and no doubt overcome by the burden and heat of the day, left Robert C. in a little log house in Easton on the morning of Aug. 3, 1845. Any way you figure it, by arithmetic or algebra, up and down, cross ways or catty corner, the answer inevitably will be the same, that was 80 years ago. A real tidy span of life, as lives go. If the rowdy in the back seat who has been interrupting this meeting can name five octogenarians of his acquaintance he will save himself from being thrown into the alley. Thank you, let us proceed.

Apparently Robert, whose name at that period had been bobbed to Bob, decided that life was too short to waste any of the precious years in idleness. He tried school for a few years, but at the age of 10 cheerfully gave it up for a job in the Warren foundry. The hardships and terrible conditions incident to the early days of the foundry are reflected with great fidelity in the accompanying reproduction of Mr. Tolmie's photograph. Although he is upright, alert and vigorous in every respect, his white hair and moustache offer mute testimony to the toll reaped by the years. He only has spent 71 of his 80 years in the foundry and is undecided whether to quit while still in his prime or to give the risky and unhealthy business a lively rassle for another 20 or 30 years. An important question like that deserves more than snap judgment and decidedly he is no snapper.

At the age of 16 our hero contracted a violent case of migratory fever. A partial cure was effected by borrowing $2 and tramping to Lambertville, N. J., where he secured a job as a molder with the Cowan Foundry Co. Here he was fortunate enough to merit the approval of one Jerry Bell.

Physical appearance did not detract from the awe with which our hero regarded a man who according to his own statement had at one time cast a 65-ton engine bed in the city of Trenton. One crane had been devoted exclusively to the job of hoisting himself and his 12 helpers into and out of the mold for a period of six weeks. Finally after the casting had cooled sufficiently a building mover and his gang had to come and take the end out of the shop before the casting could be removed to the machine shop.

Growing doubt touching on Mr. Bell's veracity was confirmed one evening when that worthy displayed a woeful lack of technique in jumping from the roof of a moving box car to the roof of a stationary car on a siding. Jerry's spine was telescoped when he struck the ground and three of his ribs collapsed when his admiring pupil plowed into him a few moments later.

Shortly afterward young Tolmie went to Trenton and having failed to find any trace of the immense engine bed or the shop in which it had been cast, he said Bah! to the memory of Mr. Bell and secured a job for himself at the Trenton Ordnance Works where he made cannon and other war equipment for 18 months.

War is an uncertain game and the manufacturers of cannon have their slack periods. Mr. Tolmie looked around for a job that promised reasonable permanency. He joined the Lobdell Car Wheel Co. on Nov. 18, 1864, and has been with that company continuously since that time.

Milestones in Foundry Progress

Recorded in the December Issues of THE FOUNDRY, Thirty, Twenty and Ten Years Ago

1895

ONE of the world's curiosities in the way of a foundry was described by S. Groves in the December, 1895 issue of THE FOUNDRY. This had been built by the joint efforts of a railway conductor and a machinist. The prize exhibit was a coke eating core oven. It burned the cores at one end of the oven and left them moist at the end nearest the door.

* * *

John Pettigrew recommended a cupola lining to follow the contour of the old fashioned lamp chimney, with the bulge at the melting zone.

* * *

Falcon Bronze Co., Youngstown, O., was incorporated with $10,000 paid up capital.

* * *

This firm which recently took over the shop of the Lumen Bearing Co. in Youngstown is now rated at several hundred thousand dollars.

* * *

Krank's Korner took a vicious jab at the cut price foundry that took a job below cost and then turned out poor work, saying:

We believe the quickest way of stopping some of the rate cutting about us is to keep an eye on the individual who receives an award under these conditions and if he does not toe the mark,shove it to him all you can and he will not care to repeat.

* * *

Pig tin was selling at 16 cents a pound, while copper was bringing 11 cents. No. 2 foundry iron was $13.25 to $13.50 a ton, Pittsburgh.

* * *

RUTHLESS RHYMES

Swede Swenson stood some six foot, two,
In his stocking feet, 'tis said.
But he flipped a ride with the switching crew.
He's shorter—half a head.

A. V.

* * *

Tom Bowers, foreman, in raking a molder over the coals for losing a bed plate casting ridiculed the idea that Providence was to blame. "The Lord," said Tom, "is with the man who uses the most clamps."

* * *

James Chalmers, in his history of a tramp molder, paid his respects to Cleveland foundries, and the climate. The latter, he said, was too cold, so he hit the side door Pullman route for the south.

* * *

Today, Chalmers probably could have found some Florida real estate interests willing to furnish him with transportation.

Faked Foundry Facts

A Narrow Gate

1905

LELAND & FAULCONER MFG. CO., Detroit, one of the earliest manufacturers of automobile castings is given considerable attention in the Dec. 1905, issue of THE FOUNDRY. Testing the cylinders, after the core sand was shaken out, but before they were tumbled, was one of the most interesting features in the opinion of the writer of this shop description.

* * *

J. Nall in sustaining the patternmakers' side of an argument as to who should assume the initiative in casting work—the patternmaker or the foundryman recommends consultation before any big job is undertaken.

* * *

This perennial argument has occupied the center of the stage through many years.

* * *

C. T. Strots claimed a melting ratio of 10 to 1 with a 48-inch cupola. The bed charge of coke is given as 1000 pounds, while the iron charges ran 1000 pounds with 100 of coke between.

* * *

Methusalah's youngest son, aged 90, was remonstrating with his foundry foreman for not getting a better melting ratio. "My father, said he, "melted at 15 to 1 in the old days." Whereupon the foreman waxed wroth and replied in uncomplimentary terms, thus originating the expression "so's your old man," it is said.

* * *

Abendroth Bros., Port Chester, N. Y., had just completed a new foundry.

* * *

1915

PENNSYLVANIA'S code of sanitary and safety regulations for foundry construction and operation were given attention in the Dec. 1915 issue of THE FOUNDRY.

* * *

A paper by Thomas D. West, prepared for the International Engineering Congress at San Francisco, outlined the various advances made in molding practice and described typical molding machines.

* * *

Foundry operations were carried on under pressure. The six months period ending with the advent of 1916, was one of the greatest prosperity. Raw materials were advancing. No. 2 pig iron was quoted at $16.95 to $17.45 a ton, Pittsburgh.

* * *

The effect of the war was becoming stronger.

The Shakeout

DAN M. AVEY, Managing Editor
PAT DWYER, Engineering Editor
CHARLES VICKERS, Nonferrous Editor
FRANK G. STEINEBACH, Associate Editor

¶ Follow the Swallow?

IN THE good old days of twenty years or more ago, the annual migration of workmen toward the South was coincident with the flight of the birds commencing toward the end of September and gradually increasing in volume until it reached its maximum toward the closing weeks of November. The great mass of labor anchored by innumerable ties, economic, social and personal, remained stationary; but the floating element including both common laborer and skilled mechanic, free as the birds of the air, followed the swallow back home. The pilgrimage was made up in part of professional hoboes who never worked, at least under a roof, but the majority of the birds of passage fled southward on the approach of winter to escape the cold.

PRESENT day foundrymen have little or no conception of the depressingly cold, drafty, old-time foundry where a few coke fired salamanders filled the air with sulphur fumes and the men with headaches. In their daily combat with the frost in the sand and with the icy breezes that whistled through every open door and broken window these salamanders never came off more than a pitifully second best. Conception of the smoke, steam and darkness of one of these establishments every day during short daylight period of the winter season is beyond the capacity of one who is familiar only with the well ventilated, glass enclosed, heated and electrically lighted foundry of 1925. Great credit is due to foundrymen and to those engineers who have seen in the foundry an opportunity to exercise the talents they possess for alleviating the trying features of human existence. Ventilation has been a matter of real study and this has resulted in types of buildings which assure an ample supply of fresh clean air, even during pouring off. Heating equipment may be had which is thermostatically controlled and gives a uniform temperature. Progress has been made in the use of glass sash and in ways of keeping this window area free from accumulated grime. Finally, illuminating engineers have contributed adequate and properly directed artificial light, so that the modern molder need not be endowed with the sight of a cat nor the instinct of a mole.

ATTENTION to the workingman's comfort has gone far to insure a stable labor situation. Isolated cases of drafty refrigerators still may be found, but the average foundry of today shows a marked improvement along many lines including creature comforts. The only class which now follows the swallow on its southern migration is the so-called idle rich.

¶ Pipe Production Grows

ALABAMA led the country in the production of cast iron pipe in 1923, according to a recent report of the bureau of census, the output of the one Southern state being half of the total for the United States. Anniston, Ala., had the distinction of being the leading city in the manufacture of cast iron pipe, almost seventy-five per cent of the output of the state being made in that city. Eleven plants manufacturing soil pipe and two devoted to pressure pipe are located there, the city boasting of approximately 3000 men engaged in this industrial activity.

PRODUCTION of cast iron pipe evidenced a remarkable growth in 1923, the output for the year being valued at $92,674,088 as compared with $44,321,548 in 1921, $50,235,101 in 1919 and $26,659,365 in 1914. However, due to fluctuations in prices, a better comparison may be had by noting the yearly tonnages. The output for 1923 was 1,609,322 tons; for 1921 771,168 tons; for 1919 702,554 tons and for 1914 1,120,721 tons. Recent statistics contained in the annual report of the American Iron & Steel institute show the total cast iron pipe production for 1924 as 1,841,350 tons, of which 1,365,272 tons was gas and water pipe and 476,078 tons soil pipe. The production of pipe and fittings increased from 702,554 to 1,841,350 tons from 1919 to 1924. In the period from 1914 to 1923 the number of establishments increased from 59 to 73.

Trade Outlook in the Foundry Industry

CONTINUED general prosperity is reflected in increasing operations among foundries, in a more settled condition as shown in advance orders for castings and by a thorough optimism toward the state of business for the remainder of this year and the first of 1926. Wages are high and some tendencies toward advance are noted, but castings prices are stiffening and foundries give less evidence of anxiety to cut quotations to meet competition. Employment figures of the bureau of labor statistics show an increase of 2.2 per cent in October over September. This marks the largest increase since February, 1923 and covers reports from 53 industries.

Building High

An unusual feature of the winter is the continued high rate of building construction. A tremendous volume of new contracts was reported in October. In fact the month's total was 27 per cent ahead of the same month last year, while the contracts for the first ten months of this year are 8 per cent in excess of the total of 1924, which was a record year. This activity is affecting hardware, plumbing, heating and soil pipe foundry business, is contributing indirectly to the total of castings orders through the increased demand for household machinery now an inseparable part of the modern home. Further, it will be felt through the extension of public service facilities, pumping and power machinery and ultimately in many other lines. Steel production has advanced steadily throughout the fall, until steel mills are operating practically at full capacity. November is expected to exceed any November since statistics of steel production have been compiled. Roll foundries have been increasingly busy since the early fall.

Prices for Raw Materials for Foundry Use

CORRECTED TO NOVEMBER 24

Iron		Scrap	
No. 2 foundry, Valley	$20.50 to 21.00	Heavy melting steel, Valley	$18.50 to 19.00
No. 2 Southern, Birmingham	21.00 to 22.00	Heavy melting steel, Pitts.	19.00 to 19.50
No. 2 foundry, Chicago	23.00	Heavy melting steel, Chicago	16.25 to 16.75
No. 2 foundry, Philadelphia	23.76 to 24.50	Stove plate, Chicago	17.25 to 17.75
No. 2 foundry, Buffalo	21.00 to 21.50	No. 1 cast, Chicago	21.00 to 21.50
Basic, Valley	20.00	No. 1 cast, Philadelphia	18.50 to 19.00
Basic, Buffalo	20.00 to 20.50	No. 1 cast, Birmingham	17.00 to 17.50
Malleable, Chicago	23.00	No. 1 cast, Buffalo	18.50 to 19.00
Malleable, Buffalo	21.00 to 21.50	Car wheels, iron, Pittsburgh	19.00 to 19.50
Coke		Car wheels, iron, Chicago	18.50 to 19.00
Connellsville foundry, coke	$6.50 to 7.50	Railroad malleable, Chicago	19.50 to 20.00
Wise County foundry, coke	7.00	Agricultural, mall., Chicago	17.00 to 17.50
		Malleable, Buffalo	19.50 to 20.00

Cast Steel Picks Up

Steel castings production shows the first signs of improvement since the fore part of the year. According to the department of commerce, the total bookings of steel castings shows 60.8 per cent of capacity for October. A comparison based upon the reports of 68 identical companies gave September orders as 48.6 per cent and August 51.2 per cent of capacity. Improvement is noted in bookings of steel castings from railway sources, but the greatest pickup is noted in miscellaneous lines, where the October contracts amounted to 70.5 per cent of capacity, compared with 55.4 per cent for the preceding month. Normally railway service comprises the largest portion of steel castings use and in this line, the bookings for October were 47.9 per cent compared with 39.6 per cent for September. No marked improvement in railway steel castings orders is observed and in consequence the general scale of steel foundry operation is low.

Car Buying Expected

Reports of car awards and inquiry indicate early purchases of railway requirements, although many believe that the bulk of this business will not come through until after the first of the year. October showed a total of 11,145 cars awarded, the largest volume for any month of 1925. For the first ten months the total of freight cars ordered was 48,500 against 113,381 for the same period last year. November showed evidence of increased inquiry, while the second week of the month gave a total of over 8000 cars ordered. The government attitude on consolidation, decision on which is expected the first of the year, probably will influence the trend of future buying. Railway specialty shops are increasing production, in part to meet current requirements, but also with a view to the demand which is expected to accompany early purchases both of cars and locomotives. Enameled sanitary ware orders declined slightly in October. The total of orders for bath tubs according to reports compiled by the department of commerce from figures given by 21 manufacturers gave 77,361 units as compared with 88,913 for the preceding month. The unfilled orders also have decreased slightly. The orders for lavatories remain constant at about 94,000 for the months of August, September and October. Wholesale prices of plumbing fixtures are advancing, slightly. Plumbing contractors are busy and jobbers are buying in larger quantities than they usually take at this season. Malleable foundry operations are improving, sustained by steady automotive demand, and by active sales of agricultural implements.

Nonferrous Operations

Brass shops making plumbing specialties are busy. Manufacturers of bearings and stick brasses also are active, but jobbing brass shops are irregular. Falling prices on copper are preventing many from stocking heavily. Aluminum scrap is in active demand with a short supply. New York nonferrous prices according to the *Daily Metal Trade* of Nov. 24, follow: Casting copper, 13.75c; electrolytic copper, 14.45c; Straits tin 63.50c; lead, 9.75c; antimony, 20.00c; nickel, 38.00c; No. 12 aluminum, producers' price, 27.50c and remelt, 25.00c to 25.50c. Zinc is 8.70c, E. St. Louis, Ill.

Comings and Goings of Foundrymen

ALBERT P. SLATER has been made general superintendent of the aluminum and brass foundries of the Detroit Aluminum & Brass Corp., Detroit. Mr. Slater is well known in the nonferrous foundry field, having been connected for some time with the Aluminum Castings Co. He also has been connected with the Willys-Overland Co., Toledo, O., and was in charge of production with the McAdamite Aluminum Co., and the General Aluminum & Brass Mfg. Co., Detroit. Much of his work has been devoted to making castings for the automotive industry.

James R. Thompson has been appointed works manager of the Trafford City foundry of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Thompson has been with the Westinghouse organization for nearly 30 years, serving as assistant works manager for the past four years under August Slusser, who died recently. Mr. Thompson became connected with the Westinghouse company in 1897 in the capacity of a time clerk, being placed in charge of the offices at Trafford City in 1904. A few years later he was made assistant superintendent and four years ago assistant works manager.

John LaMont has been made foreman of the Dutchess Tool Co., Beacon, N. Y.

George A. Hofmeister has resigned his position as general foreman of the Erie Forge & Foundry Co., Erie, Pa., to take up another line of work in Los Angeles.

R. A. McHenry, formerly assistant purchasing agent of the Symington Co., Rochester, N. Y., has been appointed purchasing agent of the Gould Coupler Co., Depew, N. Y.

H. Terhune has joined the sales staff of the Erie Foundry Co., Erie, Pa. He formerly was associated with the Chambersburg Engineering Co., Chambersburg, Pa., and before that with Billings & Spencer Co., Hartford, Conn.

J. E. Finnernan, for the past 22 years connected with the Buckeye Steel Castings Co., Columbus, O., has purchased control of the Columbus Anvil & Forging Co., Columbus, O., and has become president of the company.

Edgar O. Stamm, vice president and secretary of the Buckeye Products Co., Cincinnati, has disposed of his interest in the company to Charles J. Goehringer, president of that company. Mr. Stamm, at present, is interested in the manufacture and sale of machinery and equipment for paint and varnish manufacturers.

R. R. Clarke, General Electric Co., Erie, Pa., addressed the Buffalo Foundrymen at a meeting held Wednesday, Nov. 18, on "The Foundry Physicist." He discussed the application of scientific methods to the foundry, illustrating his talk with sketches from his background of practical experience.

Shieldon W. Hughes has resigned as manager of sales and service of the construction department of the John Harsch Bronze Foundry Co., Cleveland, and now is connected with the Diamond Bronze Co., Cleveland in the capacity of vice president and sales manager. Mr. Hughes has been connected with the John Harsch foundry since shortly after its organization.

Albert Portevin, prominent in engineering circles for his studies and investigations in metallography and testing methods, has been made Chevalier of the Legion of Honor by the French government. Mr. Portevin already has received several awards from the Societe des Ingenieurs Civils de France. He is lecturer and in charge of the laboratory work of the Ecole Centrale des Arts et Manufactures, one of the leading engineering schools in France, from which he graduated in 1902. He is also secretary of the French Revue de Metallurgie and a member of the Iron and Steel institute.

Refractory Study To Be Jointly Handled

The joint committee on foundry refractories held a meeting at Mellon institute, Pittsburgh, Sept. 14 at the call of L. C. Hewitt, Laclede-Christy Clay Products Co., St. Louis, chairman of the American Ceramic society's committee on co-operation. The joint committee has for its object standardized specifications on sizes and the simplification and testing of foundry refractories. Mr. Hewitt at this meeting, was chosen chairman of the joint committee and J. L. Cummings was elected secretary.

The representatives of the various organizations interested in this work are as follows: American Foundrymen's association, C. N. Ring, R. E. Kennedy and J. L. Cummings; Steel Founders Society of America, W. J. Corbett; bureau of standards, R. F. Geller; American Electro-chemical society, James T. McKenzie; American Refractories institute, M. C. Booze and J. S. McDowell; bureau of mines, G. A. Bole; division of simplified practice, Mr. Colwell; American Malleable Castings association, G. L. Morehead; American Society for Testing Materials, F. A. Harvey; Electric Steel Founders' Research group, C. N. Ring; American Ceramic society, L. C. Hewitt and C. E. Bales.

Two Speakers Address Eastern Foundrymen

The underlying cause of defects in castings in many cases may be detected by the X-ray according to Vincent P. Malcolm, metallurgical engineer, Chapman Valve Mfg. Co., Indian Orchard, Mass., addressing nearly a hundred members at the November meeting of the New England Foundrymen's association held recently in Boston. However, the speaker admitted that the cost of X-ray equipment was prohibitive in the case of most foundries, the complete apparatus calling for an expenditure of $15,000. A few commercial X-ray establishments now are in operation. One of these, located at the Watertown Arsenal, Watertown, Mass., is owned by the government, and another powerful metal examining X-ray laboratory is located at Long Island City, N. Y.

The speaker said that when a foundry has production work on a steel casting, in many cases it will pay to have one or two castings examined by the X-ray method, and from the results alter molding practice on the regular production work. Having located a pipe, foreign inclusion, or interior porosity by the X-ray, Mr. Malcolm advises cutting out a section to include the defect. This section should be etched with a 50 per cent hydrochloric acid and afterwards examined with a microscope or through the use of microphotographs.

Following Mr. Malcolm's talk, H.

Cole Estep, vice president, Penton Publishing Co., Cleveland, spoke on the subject of foundry merchandising, and showed with the aid of charts the inroads being made into the foundry industry by steel stampings and other materials. He told of organizations among malleable iron foundries and steel foundries and advocated a similar organization or co-operation among the gray iron foundries.

Founders Elect Officers

William H. Barr, Buffalo, was re-elected president of the National Founders association at the concluding session of the organization's twenty-ninth annual convention held at the Hotel Astor, New York, Nov. 18 and 19. L. R. Clausen, J. I. Case Threshing Machine Co., Racine, Wis. was elected vice president to succeed F. B. McBrier, Erie Steam Shovel Co., Erie, Pa. J. M. Taylor, Chicago, was re-elected secretary while A. E. McClintock, Chicago, will continue as commissioner.

L. A. Hartley, association director of education, delivered a paper entitled "Industry and the Public Schools", laying particular emphasis upon the importance of developing in a student a proper attitude toward work.

Gives Sand Tests

The November meeting of the Pittsburgh Foundrymen's association was held Monday evening, Nov. 16, in the assembly room, Fort Pitt hotel, Pittsburgh, preceded by dinner at 6:30 p. m. H. W. Dietert, United States Radiator Co., Detroit, was the principal speaker, and presented a paper on "Molding Sand Control in the Foundry." He gave a practical demonstration of sand testing to show the simplicity and rapidity with which the tests may be made and showed a complete set of testing equipment similar to the equipment shown at the convention in Syracuse and used to make sand tests. The annual Christmas gathering will be held in the English room of the Fort Pitt hotel on Dec. 21.

Acquires Alloy Firm

The Electrical Alloy Co., Morristown, N. J., has been absorbed by the Driver-Harris Co., Harrison, N. J. The personnel of the Driver-Harris Co. will remain the same with one exception. Frederick Lindsey, formerly with the Electrical Alloy Co., has been retained as sales manager of resistance materials. The other officers are: chairman of board of directors, Frank L. Harris; president, Frank L. Shriver; first vice president, William P. Martin; second vice president, Harry D. McKinney; treasurer, Stanley M. Tracy; assistant treasurer, E. A. Harleman; secretary, M. C. Harris.

Hammond Is President of Whiting Corp.

J. H. Whiting has been elected chairman of the board of the Whiting Corp., Harvey, Ill. T. S. Hammond, who has been vice president and secretary for several years succeeds Mr. Whiting as president and treasurer. R. A. Pascoe succeeds Mr. Hammond as secretary, while R. H. Bourne, has been made president of the Grindle Fuel Equipment Co., a subsidiary of the Whiting Corp., and also will continue as vice president and sales manager of the Whiting Corp., N. S. Lawrence, vice president and assistant sales manager of the Whiting Corp. also has been made president of the Swenson Evaporator Co., a subsidiary. Mr. Whiting will continue active in the business.

In the early eighties Mr. Whiting designed and patented a cupola and began to manufacture the cupola and other foundry equipment. He formed a company in Detroit under the name of the Detroit Foundry Equipment Co., but in 1893, the year of the Chicago world's fair, he moved the new company to Harvey, Ill., a suburb of Chicago, changing the name to the Whiting Foundry Equipment Co. Later this name was changed to the Whiting Corp.

As the business grew, new lines were added, including electric traveling cranes, locomotive and coach hoists and other special machinery for railroad shops and power plant. The line was further increased several years ago by the acquisition of two subsidiaries, the Grindle Fuel Equipment Co., manufacturer of pulverized coal systems, and the Swenson Evaporator Co., manufacturer of evaporators and special chemical machinery.

Discuss Cost Work

E. T. Runge, cost consultant for the National Founders association, addressed the members of the Newark Foundrymen's association Nov. 19, on uniform cost systems for foundries.

To Assist President

Henry T. Chandler has been appointed assistant to the president of the Vanadium Corp. of America, Detroit, Mr. Chandler has been associated with the Vanadium Corp. since Jan. 1, 1923 in the capacity of metallurgical engineer with headquarters at Detroit. Prior to his connection with that company, he was engaged in research and development work in the automotive field. From 1914 to 1920 he was in charge of the research laboratory of the Ford Motor Co., Detroit, investigating alloy steels and their use in applied metallurgy. From 1920 to 1923 he was connected with the C. H. Wills organization as metallurgical engineer.

Occupy New Quarters

The Diamond Bronze Co., Cleveland, has moved into its new and modern foundry at East 65 street and Sidaway avenue. The foundry is 100 x 250 feet and will accommodate about 25 molders. The plant is equipped with a battery of eight oil fired brass furnaces and two aluminum furnaces. The furance room is of fireproof construction and a sand shed and pattern storage join the foundry. The officers are as follows: A. J. Fawcett, president, treasurer and general manager; Shieldon W. Hughes, vice president and sales manager, and Robert R. Ivone, secretary and office manager.

Elect New Officers

At the last meeting of the board of directors of the Linde Air Products Co., G. W. Mead, formerly president, was elected chairman of the board. W. F. Barrett, formerly vice president, was made president. In addition to these changes R. R. Browning was elected vice president in charge of sales activities, and J. A. Rafferty, vice president in charge of engineering, manufacturing and research.

Chicago Club Active

An illustrated talk on die casting will be delivered by John S. Gullborg, president, Alemite Die Casting & Mfg. Co., Chicago, before the Chicago Foundrymen's club at the City club of Chicago, Dec. 12.

The Syracuse convention of the American Foundrymen's association was discussed at the November meeting of the club, Nov. 21. Dr. Carl Pardun and Rudolf Agte, of Gelsenkirchen, Bergwerks, A. G., Schalke, Germany, and Dr. Heinrich Griesel, of Berlin, were guests of the club.

The Cleveland office of the Sullivan Machinery Co., Chicago, has been moved from room 701 to room 1506 Rockefeller building. R. T. Stone is manager.

Forms Sand Pile Quickly

The Hayward Co., New York, has developed a new appliance for use in foundries which employ sand cutters for preparing sand. This appliance shown in the accompanying illustration operates on the principle of a clean-up bucket used in coal and ore unloading. The body of the bucket consists of two small shells attached to long lever arms. The arms are drawn together by an electric closing unit and opened by a set of toggle arms actuated by hopes and sheaves.

The front edges of the bucket are cut away so that when the bucket is closed through the sand and raised it forms a pile. The whole operation is under the control of the crane operator who manipulates the bucket by the crane and a controller which is attached by a flexible cable to the electric closing unit. The bucket requires 14 feet of headroom and cleans an area about 16x5 feet at a cut. The sand is left in piles approximately 4x4 feet.

BUCKET IS OPERATED BY AN ELECTRICAL CLOSING UNIT

Designs Portable Welder

A new engine driven welding set recently has been added to the line of welding equipment made by the General Electric Co., Schenectady, N. Y. This outfit consists of a standard welding generator driven by a gasoline engine, all mounted on wooden skids to facilitate moving from place to place.

The engine is designed especially for heavy duty. It is a four cylinder, four cycle machine with 3¾-inch bore and 5⅛-inch stroke. The rating is 22.5 horsepower. The new outfit is being marketed complete with all accesories and ready for use. This unit should be of value in locomotive repair work at roundhouses; in the construction of pipe lines and tanks and in repairs in oil fields; in ship repairs, either at the dock or by welding barge, or in any industrial plant or on any construction job where electric power is not available.

Revive Idle Plant

The Plainville Casting Co., Plainville, Conn., has purchased the Bay State Castings Co. plant at Westfield, Mass., which has been idle for some time. The Westfield plant will be immediately rehabilitated and put into operation with new equipment and with that transferred from the Plainville plant.

At a recent meeting of the board of directors of the Prest-O-Lite Co., Inc., M. J. Carney, formerly president, was elected chairman of the board. William F. Barrett, formerly vice president, was elected to the presidency. Ralph R. Browning was elected vice president in charge of acetylene sales.

Consider Cutting Waste

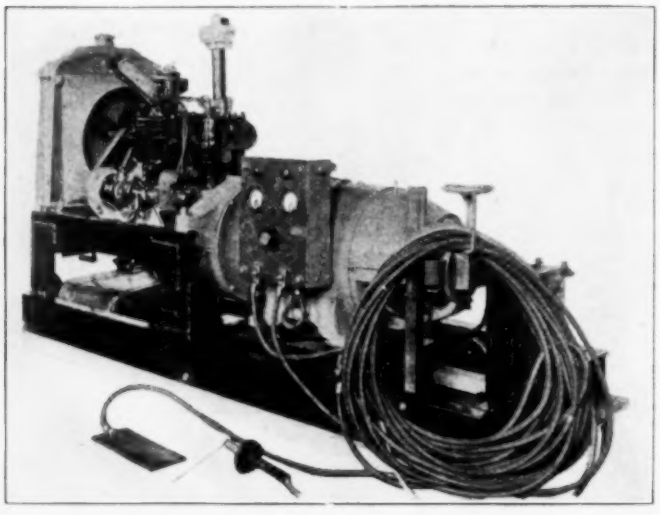
The November meeting of the Philadelphia Foundrymen's association, held Wednesday evening, Nov. 11, at the Manufacturers' club, was devoted to a discussion of the subject of "Cutting Down Waste on Castings," by John Smith, foundry superintendent of the Builders Iron Foundry, Providence, R. I., and Alan A. Wood, Philadelphia. A copy of the new constitution and by-laws was presented.

Truck Moves Load Easily

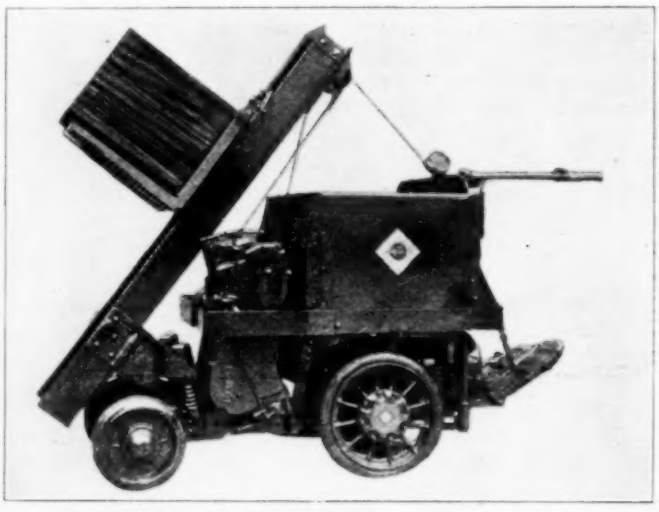
Transportation of materials around the shop is an ever present problem which can be solved by the use of modern machines. The truck illustrated may be used to handle castings, sheet metal, heat-treating boxes, etc. The truck was designed by Elwell-Parker Electric Co., Cleveland. It is driven by an electric motor receiving power from batteries carried. All four wheels turn so that the machine is steered easily. Safety features are incorporated and all motor and wheel bearings are ball bearing.

The forks which carry the load may be raised or lowered to stack or pick up the load. The uprights on which the fork moves can be inclined back at an angle which is said to aid in aligning materials for stacking. The vertical motion or the inclination are obtained by separate drums so that either motion may be used independently. The fork may be folded back when not in use.

Ralph R. Browning has been elected president, Union Carbide Sales Co., and Oxweld Acetylene Co., vice president of Linde Air Products Co., and Prest-O-Lite Co., all of New York. Mr. Browning was formerly vice president of the Electro Metallurgical Sales Corp., New York.



THE GENERATOR IS DRIVEN BY A GASOLINE ENGINE



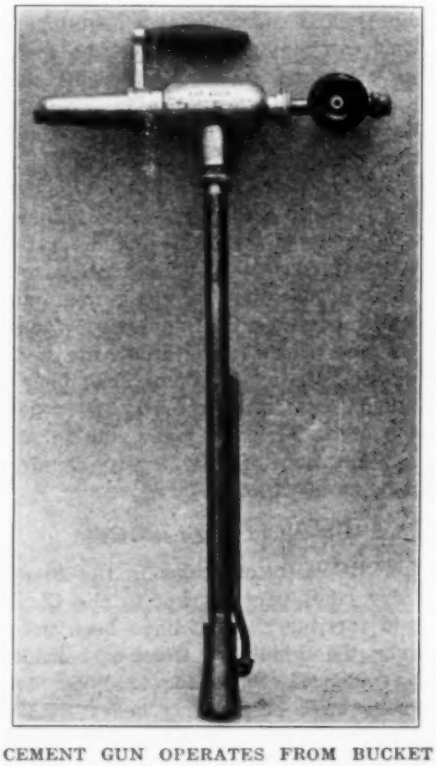
TRANSPORTATION SIMPLIFIED BY LIFT TRUCK

Produce New Refractory Products

Localized flame impingment, spalling and cracking, and clinker formation have deleterious effects upon the life of firebrick settings. To increase the life and lower the number of shut downs for repairs, the Carborundum Co., Niagara Falls, N. Y., has developed a new refractory cement that may be applied either to hot or cold settings. The principal ingredient of the cement is carborundum. The cement is prepared for by the addition of water to give it the proper consistency.

To assist in the application of the cement to fire brick settings, the same firm is offering a pneumatic gun shown in the accompanying illustration. This is portable, weighing 12 pounds and is operated either by steam or air at 100 pounds pressure. The features claimed for the gun are no moving parts, small size, compactness and easy operation, as a single valve located close to the handle controls the action. The gun does not need an auxiliary hopper, but sucks the cement directly from an ordinary pail or bucket.

The American Engineering Co., Philadelphia, has taken over the Affiliated Engineering Companies, Ltd., with headquarters in the Southam building, Montreal, Que. This company has been organized by the merger of the Taylor Stoker Co., Ltd., Montreal, and the Cleaton Co., Ltd. M. Alpern, president of the American Engineering Co., is chairman of the board of the new company and F. S. B. Heward is president.



CEMENT GUN OPERATES FROM BUCKET

Bag Is Serviceable

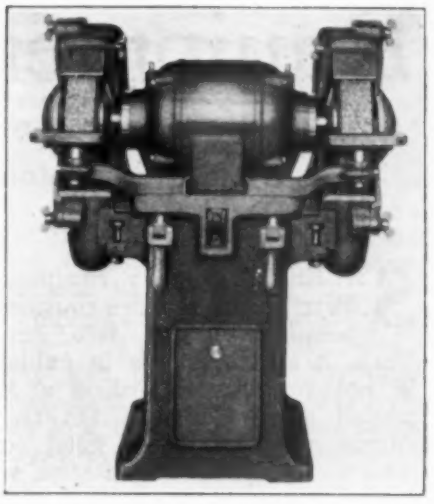
A bag of webbing and canvas for handling materials has been placed on the market by the L. H. Gilmer Co., Philadelphia. This bag is devised to withstand the rough wear and tear of being dragged over rough ground or other surfaces. The bottom is in one piece and made of heavy, closely woven cotton belting stock. The side walls are made of heavy canvas and the junction of the bottom and wall is protected by a strip of belting.

The bag is said to remain rigid so that it may be filled without being held open and the contents transported without spilling. The bag also is collapsible and may be stored readily. There are two handles at both the top and bottom and the whole is treated with a preparation to preserve it from decay.

CANVAS BAG STAYS OPEN

Joins Sales Department

W. H. Patterson, formerly vice president of the Kaestner & Hecht Elevator Co., Chicago and later vice president of the John H. Dunham Advertising agency of that city, has joined the industrial sales department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Patterson was connected with the Westinghouse company for a number of years before becoming vice president of the Kaestner & Hecht Elevator Co. a little over three years ago. He started as an apprentice student after graduating from Purdue university, Lafayette, Ind., in 1905.



GRINDER IS BUILT FOR PRODUCTION WORK

Motor Is Enclosed

The Hisey-Wolf Machine Co., Cincinnati, has added a 5-horsepower production grinder equipped with two wheels of 18-inch diameter and 3-inch face to its line of electric machines. The motor is enclosed in a dust proof case. Ball bearings are used throughout and are mounted as closely as possible to the grinding wheels, and each bearing is provided with a liberal oil chamber. An automatic motor starter is standard equipment, this device providing protection to the motor when starting and running. This feature permits the machine to be operated by an inexperienced worker, it is claimed. The operating or control button is located conveniently in the front of the machine, while the switch proper is located in the base of the machine. Wheel guards are of the full safety combination design. They are of one piece construction and are provided with standard exhaust pipe connections as well as hinged doors for quick access to the grinding wheels. The wheel spindle is 2½ inches in diameter.

Install Furnaces

Electric melting furnaces have been installed in the foundry aboard the U. S. S. MEDUSA, the first naval vessel to be designed and built solely as a repair ship. A description of this ship was given in the Nov. 15, 1924 issue of THE FOUNDRY, page 877.

The Crescent Silica Co., Ottawa, Ill., has been purchased by the Standard Silica Co., Ottawa and Chicago. Through this purchase the Standard company acquires 82 acres of land in the heart of the Ottawa district with a concrete and steel washing and drying plant and other equipment.

Equipment Buying Continues

Sales in November Reach High Total as Buying Keeps Up—Automobile Foundries Purchasing Material—Expansion Programs Being Introduced

SALES of foundry equipment in the various distributing centers continue to increase, with possibly one or two exceptions. In New York, a slackening is in evidence, although this is not pronounced, while a slight letup is reported from Chicago. On the whole, manufacturers are securing a good volume of business, which promises to continue well into the next year. Inquiries are heavy, this being a contributing factor to the optimistic trend of the market. Much of the buying is being done by plants making automobile castings. Makers of textile machinery in the New England territory again are entering the market. A number of expansion programs are noted throughout the country, and a small amount of new construction either is contemplated or under way.

Jaun Pujol, Monte 278, Habana, is constructing a new foundry to manufacture brass valves, plumbing, fittings, etc., and is in the market for electric and oil crucible furnaces for melting brass, pouring devices, sandblast equipment, brass working machinery, etc. Four sandthrowing machines have been delivered to the Citroen automobile works in Paris, France, by the Foundry Plant & Machinery, Ltd., Glasgow, Scotland, owners of the British rights to the machine made by the Beardsley & Piper Co., Chicago. These machines will be used in the manufacture of cast iron cylinders and aluminum crank cases.

Unfilled orders for foundry equipment on Oct. 1 showed a decline over the value for Sept. 1, but a considerable increase over the orders for Oct. 1, 1924, according to a report of the department of commerce. Unfilled orders for Oct. 1 were $544,042 as compared with $598,143 for Sept. 1 and $327,291 on Oct. 1 a year ago. Shipments of equipment in September also were less than in August, the September total being valued at $351,121 as against $388,371 in August and $234,769 in September, 1924. Sales slumped, the September value being $296,438 as against $580,865 in August and $219,279 in September, 1924.

December Prospects Appear Bright

ALTHOUGH Chicago district foundries continued to be heavy purchasers of pig iron and coke in November they eased up in their equipment buying. Presumably this reflects the depletion of 1925 appropriations, and improved buying is looked for after the turn of the year. The Allis-Chalmers Mfg. Co., Milwaukee, is installing a second sand throwing machine, manufactured by the Beardsley & Piper Co., Chicago. The Standard Foundry Co., Racine, Wis., Studebaker Corp., South Bend, Ind., Link-Belt Co., Indianapolis, Central Foundry Co., Fort Wayne, Ind., Paragon Foundry, Oregon, Ill. and the Washington Iron Works, Shennan, Tex., have purchased sand mixers from the National Engineering Co., Chicago. Shakeout bails have been purchased by the Rundle Mfg. Co., Milwaukee, and shakeout and vibrator equipment by the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., from the Stoney Foundry Engineering & Equipment Co., Cleveland. The Simmons Co., Kenosha, Wis., has contracted for dust arrester equipment from the Pangborn Corp., Hagerstown, Md. The American Range Corp., Shakopee, Minn., has purchased tumbling mill equipment, the Dodge Mfg. Co., Mishawaka, Ind., has taken a sandblast room and the Benton Harbor Castings Co., Benton Harbor, Mich., has ordered a tilted sandblast mill from the W. W. Sly Mfg. Co., Cleveland. Molding machines have been sold to the Northwestern Malleable Iron Co., Milwaukee, the National Brake & Electric Co., Milwaukee, and the Weil-McLain Co., Michigan City, Ind., by the Herman Pneumatic Machine Co., Zelienople, Pa. The Clark Equipment Co., Buchanan, Mich., has ordered two tumbling barrels from the J. S. McCormick Co., Pittsburgh.

Improvement in New England

MISCELLANEOUS sales of smaller foundry equipment have shown marked improvement during the last week or ten days in New England. The market has expanded to include nearly all industries and sales have been particularly numerous among the smaller plants. The textile machine manufacturers, who for the most part have been out of the equipment market for two months or more, now are commencing to buy and inquiry from this source points to heavier purchases in the future. This improvement is attributed to the foundry melt in the district which has increased consistently since the middle of November. The General Electric Co. has been a prominent buyer of sand blast apparatus, molding machines and miscellaneous equipment. That company has secured two molding machines for its plant at Everett, Mass., and one for the plant at Lynn, Mass., from the Herman Pneumatic Machine Co., Zelienople, Pa. The Chapman Valve Mfg. Co., Indian Orchard, Mass., also has secured one machine from the same manufacturer. A Providence, R. I., foundry bought molding machines, a riddle and conveying equipment. Connecticut foundries are active. The Plainville Casting Co., Plainville, Conn., has bought foundry equipment recently for expansion at its Plainville plant and for the rehabilitation of a recently acquired plant at Westfield, Mass.

Cleveland Business Good

IMPROVED conditions in the foundry equipment market in the Cleveland territory, which have been noted since the middle of October, continue in evidence. Sales for the past two weeks have been fairly heavy, and it is believed that November will be one of the high months of the year in the

point of sales. Inquiries are developing in sufficient volume to create an optimistic feeling among men of the trade, who see no recession in buying in the immediate future. Much of the business now before the builders of equipment is from companies making automobiles. Sales of cleaning room equipment include a tumbling mill purchased by the Ohio Malleable Iron Co., Columbus, O., from the W. W. Sly Mfg. Co., Cleveland. The Packard Motor Car Co., Detroit, has secured dust arrester equipment from the Pangborn Corp., Hagerstown, Md. The Cadillac Motor Car Co., Detroit, and the Ford Motor Co., Detroit, each have purchased two shakeout bails from the Stoney Foundry Engineering & Equipment Co., Cleveland, while the Standard Sanitary Mfg. Co., Louisville, Ky., has taken one shakeout bail from the same manufacturer. The Ferro Machine & Foundry Co., Cleveland, has ordered three molding machines from the Stoney company. A core making machine has been contracted for by the Youngstown Foundry & Machine Co., Youngstown, O., from the J. S. McCormick Co., Pittsburgh.

New York Sales Slump

FOLLOWING the improvement a fortnight or so ago, foundry equipment buying in the New York metropolitan district has slumped off. Sellers assert there appears to be nothing like the steady flow of business that might be expected at this season of the year. Especially noticeable is the lack of buying for new construction. With few exceptions there has not been any business of this character and in some cases where expansion is under way there is a tendency to hold off. This condition may be caused by the fact that jobbing foundries have shown little gain in operations over the early part of the month, although brass foundries appear fairly active. Recent buyers include the United States Cast Iron Pipe & Foundry Co., which has closed on a 5-ton electric crane to the Niles-Bement-Pond Co., New York. Sandblast equipment has been purchased by the Eastern Steel Casting Co., Newark, N. J. and the Merchants Despatch Transportation Co., Binghamton, N. Y., from the Pangborn Corp., Hagerstown, Md. The General Electric Co., Elizabeth, N. J., has taken tumbling mills from the W. W. Sly Mfg. Co., Cleveland, while vibrators and shakeout equipment have been sold to the Southern Wheel Co., Rochester, N. Y., by the Stoney Foundry Engineering & Equipment Co., Cleveland. Plans are being prepared by the Vulcan Iron Works, Wilkes-Barre Pa. for the replacement of a portion of its plant recently badly damaged by fire. The Florence Pipe, Foundry & Machine Co., Florence, N. J., previously noted as building a plant addition, is still in the market for a portion of the equipment to be required. With the exception of sand, for which there is always a demand at this season of the year because of the necessity of getting in this particular material before cold weather sets in, the general run of foundry supplies are moving rather slowly.

Pittsburgh Market Active

NOVEMBER developed considerable business for foundry equipment and supply sellers in Pittsburgh and vicinity. On the basis of orders and inquiries it appears that foundries are maintaining increasingly high operating rates. Some dealers report buying is on a somewhat moderated scale from the heavy October rate but generally interest in equipment is high, molding machine inquiries still being numerous. The majority of inquiries for this class of equipment call for single machines, usually of the large rollover type, but a number of group installations are contemplated among the pipe and fitting manufacturers. Recent orders received by the Herman Pneumatic Machine Co., Zelienople, Pa., include one each for the Hood Furnace Supply Co., Horning, N. Y., and the Ford & Kindig Co., Conshohocken, Pa. · The J. S. McCormick Co., Pittsburgh has sold a large number of cupola charging cans recently to foundries in nearby points. Cleaning room equipment recently purchased includes sandblast equipment to the Carbon Steel Casting Co., Lancaster, Pa., the Vulcan Mold & Iron Co., Latrobe, Pa., and the Standard Tank Car Co., Sharon, Pa., this business going to the Pangborn Corp., Hagerstown. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has ordered sandblast rooms and the Danville Stove & Mfg. Co., Danville, Pa., has taken tilted sandblast mills from the W. W. Sly Mfg. Co., Cleveland. One of the largest oven inquiries to come up recently is from a car builder for a battery of six, each to be 5 feet wide by 8 feet high and 12 feet deep. Several portable core oven inquiries are out here, one of the portable drawer type and another of the portable swing door type. The Union Radiator Co., Johnstown, Pa., wants a cupola and one or two other cupola inquiries of long standing still are before the trade. The Richmond Radiator Co., Uniontown, Pa., recently was shipped three 800-pound ladles and is understood to be in the market for four enameling ovens and a number of molding machines, etc., to increase its capacity by at least 25 per cent. The Federal Radiator & Boiler Co., Zanesville, O., also is increasing its capacity, buying additional equipment, while the Penn Furnace & Stove Co., Warren, Pa., is said to be contemplating the purchase of some equipment. The Union Switch & Signal Co., Swissvale, Pa., recently bought some small ladles. The Pulaski Foundry & Mfg. Corp., Pulaski, Va., is entertaining bids on a core oven, air compressor, etc. Crane orders of late have been scarce although a few hoist sales have been noted. The Lansdale Foundry Co., Lansdale, Pa., bought a 3-ton 19-foot span, 2-motor used crane from T. B. MacCaher, Philadelphia. The Phoenix Iron Co., Phoenixville, Pa., is inquiring for one 10-ton, one 30-ton and a special soaking pit crane.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Lyon Iron Works, Green, N. Y., which has been in operation since 1840, has changed its line of production within the past year and now is manufacturing a line of skid platforms, industrial trailers, trucks, casters and similar units. Distribution is through Fink-Dumont-White Co., Inc., New York. F. P. Fink and R. B. Dumont, of that company recently bought a substantial interest in the company and have been elected vice president and secretary-treasurer. George G. Raymond continues as president and general manager.

Brawman Piston Ring Mfg. Co., Dallas, Tex., has been incorporated with $50,000 cap-

ital by G. H. Brawman and L. M. Manley, 3212 Bowen street.

Hart Tractor Co., Charles City, Iowa, will rebuild the burned portion of its plant.

Penn Steel Casting Co., Chester, Pa., will rebuild its burned pattern shop.

American Radiator Co., Buffalo, will build a 1-story castings cleaning room.

National Steam Pump Co., Upper Sandusky, O., will build a 1-story addition 40x80 feet.

Standard Forgings Co., Indiana Harbor, Ind., D. R. Carnell, is having plans made for a foundry addition.

H. B. Smith Co., 640 Main street, Cambridge, is building a 1-story machine shop at Westfield, Mass.

Flint Foundry Co., Flint, Mich., is having plans made for rebuilding its foundry, recently burned.

Lakey Foundry Co., Lansing, Mich., will build a plant addition to house 30 core ovens and other foundry departments.

J. B. Klein Iron & Foundry Co., 1006 West Second street, Oklahoma City, Okla., will build an addition 75 x 125 feet.

LeBaron Foundry Co., Brockton, Mass., recently suffered loss of a portion of its plant by fire and will rebuild.

Acme Foundry & Machine Co., Coffeyville, Kan., is having plans made for a 1-story foundry addition.

Julian d'Este Co., Charlestown, Mass., suffered a severe fire loss in its brass and bronze foundry, which will be rebuilt.

J. C. Bayer is building a 1-story foundry at 477 East Thirtieth street, Portland, Oreg. C. W. Ertz Co. has the general contract.

Scovill Mfg. Co., Waterbury, Conn., brass and bronze tubing, will build a 1-story foundry addition.

Machine shop and foundry of Ballard Drop Forge Co., Seattle, Wash., were burned recently.

Woburn Iron Foundry, Woburn, Mass., will rebuild its burned foundry and will require additional equipment.

Bessemer Gas Engine Co., Grove City, Pa., J. P. Henry superintendent, will add considerable equipment to its shops. (Noted Nov. 1.)

Federal Radiator & Boiler Co., Zanesville, O., Theodore F. Schlade manager, is having plans made for a 1-story foundry 100x200 feet.

Warwood Tool Co., Warwood, W. Va., H. H. Kitsner general manager, will establish a plant at Eleventh street and Philadelphia road, Baltimore, for manufacture of piston rings.

Mechanical Pattern Works, 4545 Pacific boulevard, Vernon, Calif., has completed two 1-story additions, one for a foundry and the other for a pattern shop. (Noted Aug. 1.)

Kirkwood Mfg. Co., Preston, Ont., has taken over the plant and equipment of the Electrical Fittings & Foundry Co. and is adding equipment for increasing production of fittings.

Harbord Island Brass Foundry, Seattle, Wash., has been incorporated with $17,500 capital by J. D. Carmichael, George D. Davis and O. R. G. Thayer.

Crompton & Knowles Loom Works, Inc., Worcester, Mass., manufacturer of textile machinery, will build a 4-story addition 40 x 74 feet.

Standard Semi-steel Foundry Co., Springfield, Mo., C. Wilks general manager, Clinton, Mo., will build a 1-story foundry 64 x 200 feet on West Chase street.

American Automatic Connector Co., 118 Noble Court, Cleveland, M. A. Barber president and C. C. Feil secretary, is planning erection of a plant to manufacture car couplers.

Hewitt Co., South Ninth street, Maywood, Ill., will build a 1-story foundry addition 42x60 feet. Truscon Co., 165 East Erie street, Chicago, has the general contract. (Noted Nov. 15.)

A $250,000 contract has been awarded to J. W. Ferguson, 40 West Fortieth street, by the Standard Sanitary Mfg. Co., Pittsburgh, for the erection for a 4-story branch plant, 100 x 372 feet, at Newark, N. J.

Foundries of the Ward Heater Co., at Los Angeles and Pasadena are being consolidated and a new cupola installed, to increase capacity for production. Samuel Sprout is president of the company. (Noted April 1.)

William Olderman Co., Bridgeport, Conn., smelter and refiner, has been incorporated with $50,000 capital to continue the partnership formerly operating the business and will add a brass foundry.

Jackson Valve & Mfg. Co., Inc., 1106 Fifteenth street, Portsmouth, O., manufacturer of high pressure steam valves, will build a foundry and machine shop to produce and finish its own castings.

Gardner Governor Co., Quincy, Ill., H. Malone purchasing agent, will build a 1-story foundry 100 x 250 feet. Frank D. Chase, 720 North Michigan boulevard, Chicago, is engineer.

Jenkins Mfg. Co., 35 Farrand street, Bloomfield, N. J., manufacturer of red brass fittings, will build a 1-story foundry addition and an electric furnace equipment to increase capacity materially. (Noted Nov. 1.)

Plainville Casting Co., Plainville, Conn., will remodel and add equipment to the plant of the Bay State Castings Co., Westfield, Mass., which it recently bought. Some equipment will be supplied from the Plainville plant.

American Closet Valve Co., Indianapolis, Ind., manufacturer of enameled iron products, shortly will occupy a new building 60x132 feet, the space in old plant thus vacated to be equipped as a brass foundry. An iron foundry will be built.

Ace Foundry Co., 1600 South Kilbourne avenue, Chicago, has been incorporated with 200 shares no par value to operate a foundry and machine shop by Charles L. Barrett, Mack C. Wylie and Harold Bennett. Gann, Secord & Stead, 105 South La Salle street, are attorneys.

Ypsilanti Foundry Co., Ypsilanti, Mich., will erect two additional units to its foundry. One will be 50x80 feet and the other 100x100 feet. The company recently erected a two-story warehouse building. A record breaking sales year in 1925 is given as the reason for the expansion. (Noted Nov. 15.)

Arkansas Foundry Co., Little Rock, Ark., structural fabricators and machinery manufacturers, is building an addition to its foundry and is in the market for molding machines, cupola and sand blast. It also is in the market for a used steel building 60x150 feet and 20 feet high. (Noted Nov. 15.)

Pierce, Butler & Pierce Mfg. Co., 41 Forty-second street, New York, manufacturer of steam boilers and radiators, has purchased the plant and business of the Engleby Bros. Co., Roanoke, Va., and will operate it. The company has plants at Eastwood, Syracuse and Oswego, N. Y., Huntington, Pa., and Zanesville, O.

The Penn Steel Casting Co., Chester, Pa., will start work shortly rebuilding a portion of its plant, which recently was damaged by fire. The loss was estimated at $10,000.

Dole Valve Co., Chicago, Andrew R. Dole president, 1923 Carroll avenue, will build a 2-story addition 100x120 feet. Joseph C. Llewellyn, 38 South Dearborn street, is architect.

Northwestern Malleable Iron Co., Milwaukee, will spend about $100,000 in modernizing its annealing facilities. The present battery of 12 ovens will be replaced by a new continuous type, 20x202 feet, reducing the period of annealing from eight to seven days, with greater uniformity of result. The foundations are being constructed and bids on the oven work will be taken shortly, so that the facilities will be ready for use about Feb. 15 or March 1.

Under a lease arrangement, the Interstate Car & Foundry Co., Indianapolis, has been incorporated to take over the business of the Inter-State Car Co. according to Eugene H. Darrach, president and treasurer of the old organization. Directors of the leasing company are George J. Diver, Leo R. Meyer and Frank B. Stout, all associated with the old company. Orders have been received to fill the capacity of the foundry department. The car department will continue to be operated as in the past.

Negotiations have been completed whereby the Corbet Foundry & Machine Co., Owen Sound, Ont., and the G. E. Stevenson Co. of Indianapolis, Ind., have amalgamated. As a result a multiple shaper and gear cutter will be manufactured at Owen Sound. The new firm will be known as the Corbet Machine & Gear Co., with head office at Owen Sound, and capital stock of $340,000. Officials of the company include Richard Corbet, president; G. E. Stevenson, vice president; and Fred J. Corbet, secretary-treasurer.

New Trade Publications

ROLLER BEARINGS—A dimension and load bulletin giving the size of bearing required has been published by the Hyatt Roller Bearing Co., Newark, N. J. Tables are given showing the various factors that determine the size of bearing.

MOTORS—Polyphase induction motors with cast steel frame and roller bearings are featured in a bulletin by the Allis-Chalmers Mfg. Co., Milwaukee. Full details of construction are presented in photographs.

MATERIALS HANDLING—Electrically driven machinery for handling materials in many branches of industry is described in a catalog by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Information is given of the principal groups of materials handling machinery, giving uses, typical outputs and electrical equipment best suited to their operation and describes Westinghouse equipment designed for such uses.

CORE OVENS—Two installations of its core ovens are shown in detail in a bulletin by the Swartwout Co., Cleveland. One is electrically heated with a rated capacity of 1000 kilowatts. The other is oil fired.

COMPRESSORS — Pennsylvania Pump & Compressor Co., Easton, Pa., is distributing a general products catalog designed to give concisely a comprehensive view of the company's complete line of products.

TRAMRAILS—How production costs may be lessened by modern handling equipment, thus putting the producer in position to compete more keenly in his field is illustrated in an illustrated book of pocket size by the Cleveland Electric Tramrail division of the Cleveland Crane & Engineering Co., Wickliffe, O. The illustrations show actual installations in a variety of plants.

CRANES—Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., has issued a bulletin showing uses of a single I-beam crane manufactured by the company.